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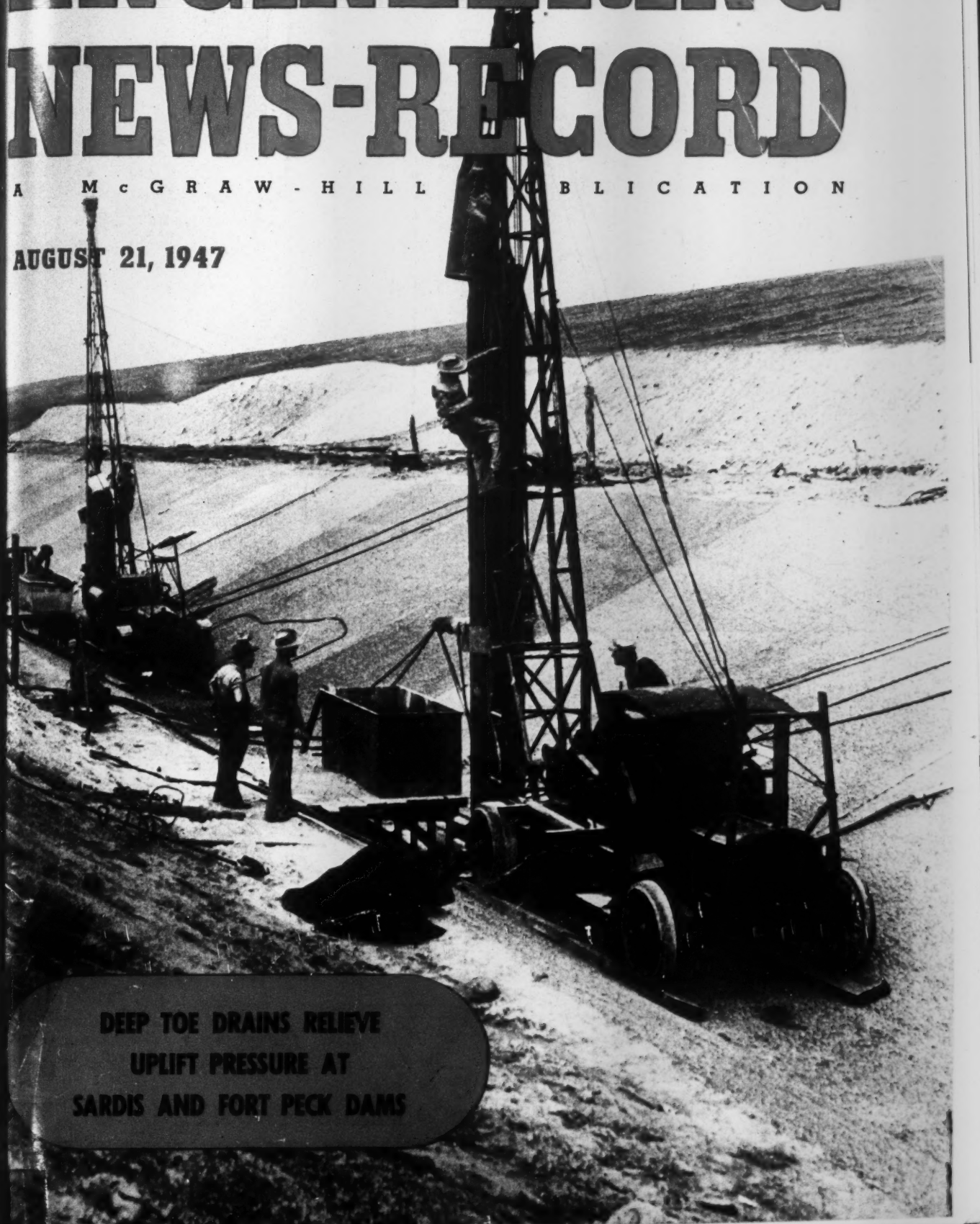
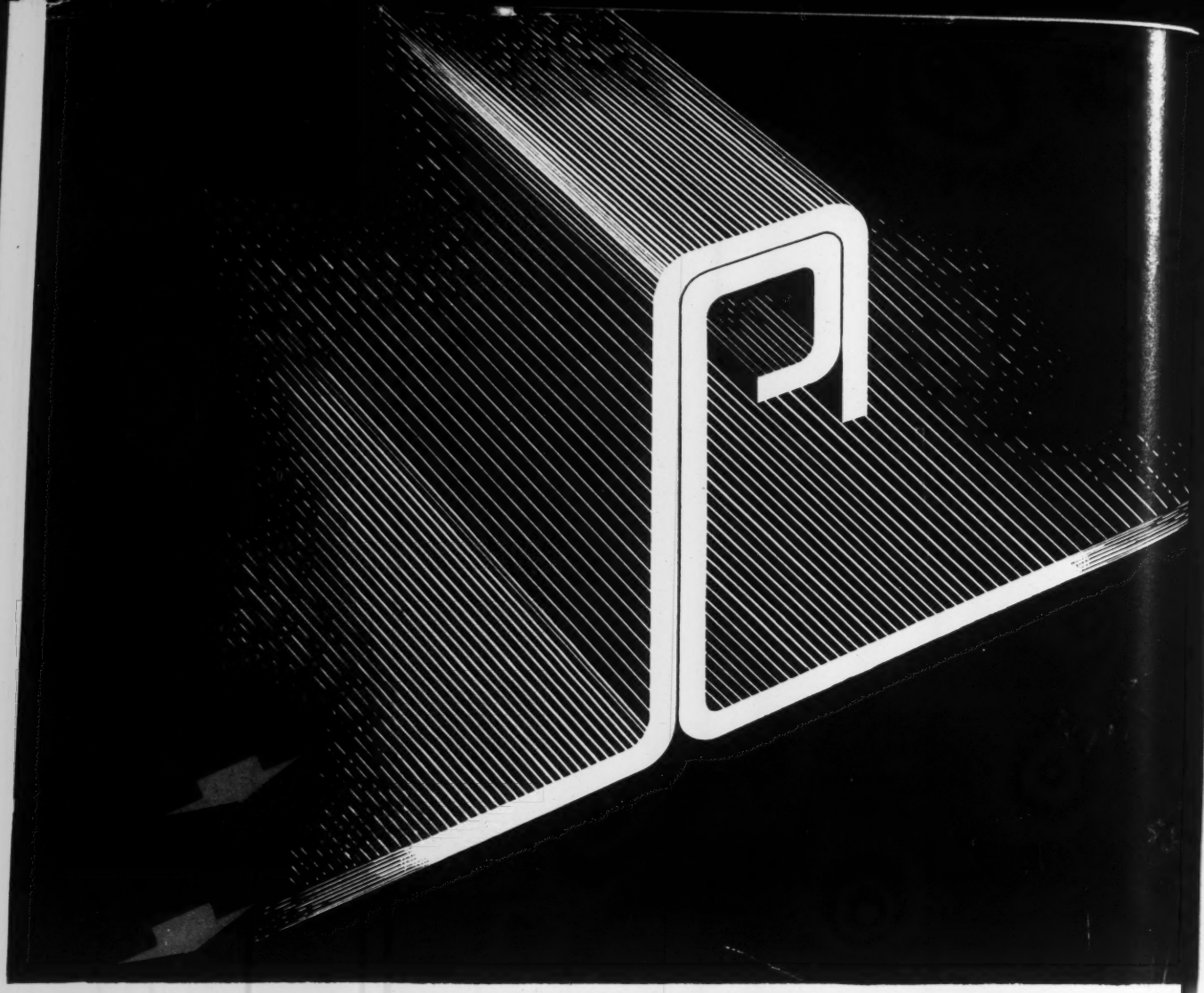
# ENGINEERING NEWS-RECORD

A McGRAW-HILL PUBLICATION

AUGUST 21, 1947



DEEP TOE DRAINS RELIEVE UPLIFT PRESSURE AT SARDIS AND FORT PECK DAMS



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# ENGINEERING NEWS-RECORD

Volume 139 • Number 8

AUGUST 21, 1947



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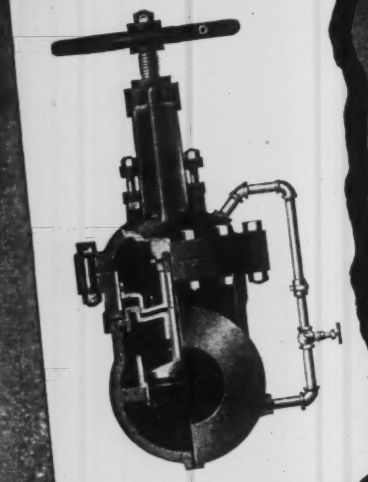
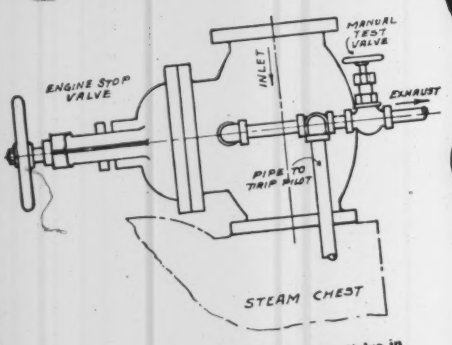


## HOW TO AUTOMATICALLY PREVENT TURBINE OR ENGINE OVERSPEEDING

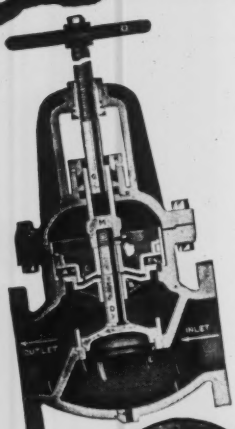
## install GOLDEN-ANDERSON THROTTLE and AUTOMATIC ENGINE STOP VALVES




Golden-Anderson Throttle-Engine Stop Valve in horizontal position with downward steam flow.

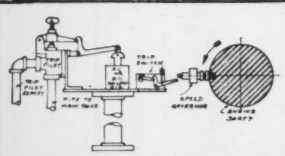
On overspeeding of engine or turbine the shaft governor may directly operate trip pilot control valve or limit switch, if solenoid trip pilot control is used, to open trip pilot control valve and permit engine stop valve to instantly close and stop engine or turbine.

By running down handwheel stem the valve may be closed any time, and by-pass valve should be closed when the valve is to be maintained in closed position over a period of time.

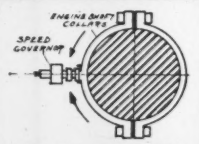


## *Free Engineering Aid...*

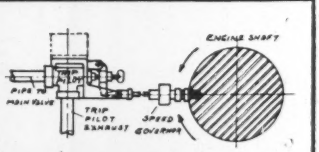
**Let GOLDEN-ANDERSON engineers help you on any new or replacement valve problem.**



Electric trip pilot and switch assembly with governor attached to engine shaft.




Governor mounted with split collars attached to engine shaft.




Mechanical trip pilot assembly with governor attached to engine shaft.

GA **GOLDEN-ANDERSON VALVE Specialty Company**
KEENAN BUILDING · PITTSBURGH 22, PA.

# News of the Week

ENGINEERING NEWS-RECORD • AUGUST 21, 1947 • VOLUME 139 • NUMBER 8

## Reclamation Bureau plans $195 million of construction

### *Western irrigation, hydro-electric power, and related resources to be developed by 1954—Full list of projects announced*

Bureau of Reclamation regional offices have been instructed to proceed on a "full-steam-ahead" basis on the $195,000,000 in construction work set as the goal for the fiscal year 1948. The bureau has also revealed the specific work to be done on its many projects.

This year's construction is expected to be an important step in the $1.5 billion of incompleted authorized work for the development of western irrigation, hydroelectric power and related resources.

Bureau operations are aimed at substantially achieving the long range goal for 1954. It envisages both full and supplemental irrigation water supplies for 3,875,000 acres of land, the installation of 2,250,000 kw. of hydroelectric power capacity, and other stream development benefits such as flood, sanitation, silt control, fish and wildlife, and recreation.

At recent sessions Congress has appropriated specific amounts of money for each project listed on the 1948 construction schedule, and the funds cannot be interchanged. The $195,000,000 work schedule is laid out so as to accommodate an economical rate of construction on all projects. At least five of the major projects are expected to run out of funds before the end of the fiscal year and require supplemental appropriations totaling about $36,000,000 to keep the jobs going. These five projects are: Columbia Basin and the Yakima-Roza in Washington, the Colorado-Big Thompson in Colorado, Davis Dam on the Arizona-Nevada border, and the Central Valley Project of California.

Restrictions which the last Congress placed on the 1948 program include decentralization of design and specifications services. Since financial limitation was placed on the engineering services which can be provided in the Denver engineering offices, delegation of design duties to field offices is now being effected to keep expenses to a minimum. Because the last Congress also ordered curtailment of "force account" work, some projects where available funds are not sufficient to let additional contracts will not proceed.

Projects to be advanced, the principal work to be done on these jobs, and the amount of money expected to be available, state by state, are as follows:

#### Breakdown of expenditures

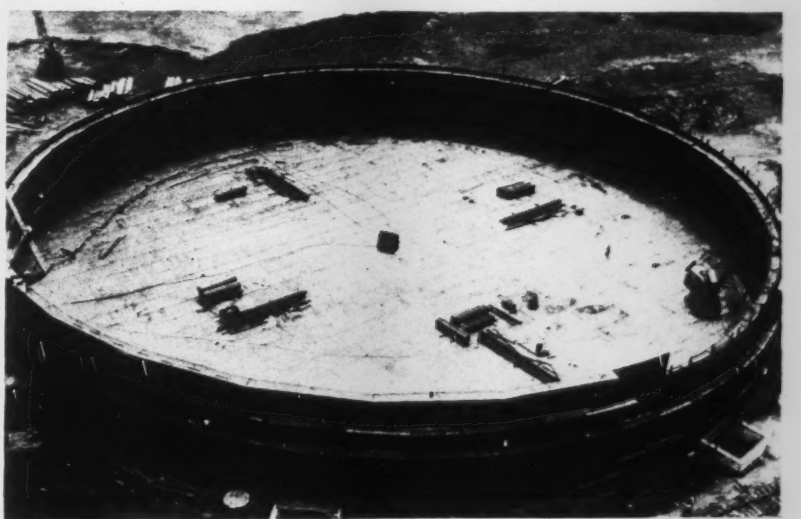
Arizona—Complete contract on major construction of canal and laterals for Yuma-Mesa division of Gila Project; predevelopment work on farm lands; initiate Welton-Mohawk division construction, $2,190,000.

Arizona-California — Final minor construction on Parker Dam, power house, and transmission facilities, $140,000. Channel maintenance and local flood protection work for Colorado River levee system, $1,150,000.

Arizona-Nevada—Drilling, grouting and miscellaneous operations, including drainage system, on Boulder Canyon Project, $630,000. Reduced-scale construction of Davis Dam and transmission until available funds are exhausted, $20,670,000. (including desired supplemental appropriation of $8,700,000).

California—On Central Valley Project, installation of drum gates, penstocks, and two generators in shasta dam and gates and other appurtenances on Friant Dam will be virtually completed; two generators will be installed at Keswick Dam; construction on Contra Costa, Clayton and Ygnacia canals nearly completed; construction on the Delta-Mendota and Friant-Kern canals expedited, including new contracts; construction of Tracy pumping plant; and

(*Continued on page 74*)



Press Assn. photo.

***Biggest All-Welded Gas Holder**—What is said to be the world's largest all-welded gas tank is being constructed at Elizabeth, N. J., for the Elizabethtown Consolidated Gas Co. Having a capacity of 10,000,000 cu. ft., the holder is 276 ft. 6 in. in diameter. The water tank is 38 ft. high and the holder when full will be 227 ft. high. Contractor is Stacey Brothers Gas Construction Co. of Cincinnati, Ohio.*

# Surveyors and mappers expand work and adopt new constitution

## *Annual meeting of the American Congress on Surveying and Mapping at Washington discusses many technical subjects*

By an overwhelming vote the American Congress on Surveying and Mapping at its seventh annual meeting last week in Washington, D. C. adopted a new constitution that changes the number of key officials in the society. At the same time it voted to increase dues of individual membership in the association from $4 to $5 per year.

With the new constitution the board of directors is increased from 6 to 12 members. A setup that called for 10 regional vice-presidents or one for each of ten regions is eliminated and in its place is substituted an advisory council consisting of one member from each state and the District of Columbia. The elected officers will consist of a president, a vice-president, a treasurer and a secretary, and the board of directors. The members of the advisory council will be appointed.

It was because expenses of operating the society have increased about 20 percent in the last year that the dues were increased, and also because on account of the increased growth of the society in recent years the congress's work has been expanded greatly. The total membership is now over 1,400, including 1,360 individual members, the greatest it has ever been. It was increased by 400 last year.

The technical session was largely attended, with a registration of nearly 300, including representatives from 24 states, Canada, two European countries, and six Latin American republics. Most of the first day was devoted to panel discussions of methods of improving surveying and related curricula of U. S. colleges and universities. The discussion was led by Prof. George H. Harding of Ohio State University, assisted by six men of wide experience in surveying work.

It was the general opinion that the colleges should stick to fundamental theory and broaden the scope of their courses to assure coverage of all the new procedures developed during the war, rather than to attempt to give extensive training in any one method. Neither did the group believe that a special degree should be given in surveying and mapping, except perhaps in a few schools specializing in this work. Instead, surveying subjects should remain as fundamental courses for a civil engineering degree. It was further stressed that with many engineering colleges placing increased emphasis on the humanities, expansion of the amount of credit hours devoted to surveying and related subjects would be difficult.

The fundamental principles for determining the amounts of fees to be charged for survey work was the other subject discussed by the entire group. This forum was led by S. A. Bauer, civil engineer and surveyor of Cleveland, Ohio, assisted by five other men in private business. Although a few speakers felt that surveyors should organize and establish fees to be charged by all for the normal types of property surveys, a much greater number felt such a plan unsound. Instead, they believed that the fees for property surveys would be decided as each project is carried out, with the amount of the fee based on the following major factors: Importance of the survey, the time involved, standards of work, value of property surveyed, the professional ability of the man doing the work, and a factor that took into account how much work the surveyor had done in the past for the same firm and what he could be expected to do as follow-up of the survey, such as testifying in court.

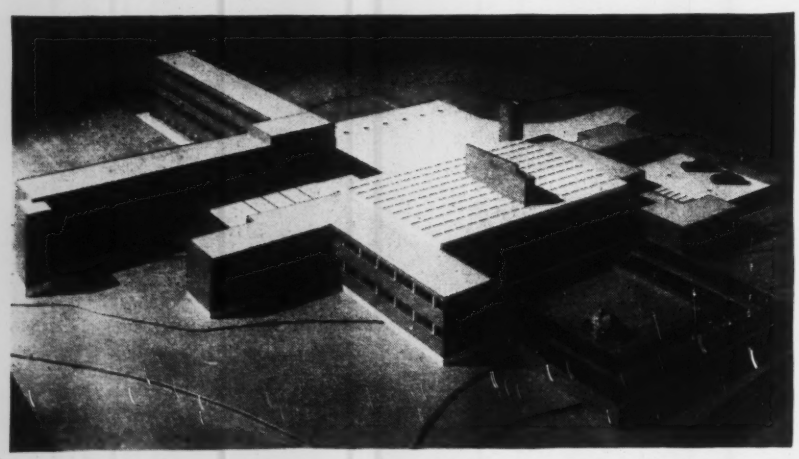
Technical papers presented included a description by Charles R. Manor of the Engineer Research and Development Laboratories, Ft. Belvoir, Va., of the 10-second optical-reading theodolite recently developed for Army use in cooperation with Keuffel & Esser Co., Hoboken, N. J. This instrument, in addition to being of sturdy, lightweight construction, is the first optical-reading theodolite produced in the U. S. that can be read successfully to 10 seconds. A more detailed description of this instrument will appear in an early issue of *Engineering News-Record*.

Two big problems — the lack of trained personnel and the great need for up to date equipment—must be overcome before mapping and surveying work in Latin America can advance at a rapid rate, Jorge Zarur assistant director, National Council on Geography of Brazil, reported. He said that several of the countries have good sized staffs, but that they were extremely handicapped by their meager equipment. Despite this, good work is being done in Costa Rica, Brazil, Argentina, Chile, Venezuela and Colombia. During the last year Mr. Zarur has been on a special assignment evaluating surveying progress in all of Latin America.

"The Land Surveyor's Social Role" was the title of a comprehensive paper by L. Germain Gastonguay, member of the board of direction, Corporation of Quebec Land Surveyors.

Highlight of the closing session was a description of recent electronic de-

(*Continued on page* 72)



***Hospital for Alcoholics**—Model of a new radiant-heated Keeley Institute building, designed for the rehabilitation of alcoholics, indicates efforts in architectural treatment to achieve a residential character. The $500,000 structure, to be built at Dwight, Ill., will be of reinforced concrete and brick, with partitions between rooms carrying the load of the thin concrete floor slabs above. Architects are Schweiker and Elting of Roselle, Ill., and consulting structural engineer is Thomas R. Shaver.*

## Iron and Steel Institute charged with price fixing

The Federal Trade Commission on Aug. 16 filed a formal complaint against the American Iron and Steel Institute and its members charging illegal price-fixing and restraint of competition.

A hearing will be held on Sept. 19 at 2 P. M. in the FTC offices in Washington. If the hearing results in a cease-and-desist order, the steel industry would be required to break up the basing-point system, which was the principal target of the charge.

The FTC explained that the respondents have agreed upon a common list of charges to be added to base prices in lieu of switching, shipping and freight charges. These are stated to have been compiled and published by the AISI and to be used by the producers in computing their delivered price quotations.

## Engineers go to Japan to advise on reconstruction

Several engineers from the construction industry have gone to Japan as part of a team to make a comprehensive industrial survey of that country. All of the men are making the trip as representatives of Overseas Consultants, Inc., which was recently organized, following the urging of General MacArthur that private consultants be called in to make the study.

Overseas Consultants was created at the request of the War Department. A non-profit organization, it represents eleven firms, most of them doing extensive work in the construction industry. These firms are: Jackson & Moreland, Boston; Coverdale & Colpitts, New York City; F. H. McGraw & Co., Hartford, Conn., and New York City; Ford, Bacon and Davis, Inc., New York City; Sanderson & Porter, New York City; Stone & Webster Engineering Corp., New York City; The J. G. White Engineering Corp., New York City; Ebasco Services, Inc., New York City; Madigan-Hyland, Long Island City; The American Appraisal Co., New York City; and Standard Research Consultants, Inc., New York City.

President of the new organization, which was created specially for the Japan study, is Clifford S. Strike, also president of the F. H. McGraw firm. He has had extensive experience on construction work and in July, 1945, was named to head the building materials and construction section of the U. S. military government in Germany, later serving as deputy chief of the reparation section. In these assignments he worked closely with the French, British and Soviet officials. Strike was not a member of the staff that has already gone to Japan, but he will go later.

In his work in this country Strike is being assisted by Frederick J. Mayo, also of the F. H. McGraw firm. F. C. MacKrell of the Stone and Webster organization will act as executive officer of Overseas Consultants.

Of the group already in Japan, R. J. Wysor, former head of the Republic Steel Corp., and one-time chief of the U. S. military government's metals branch in Berlin, will act as project manager.

Other engineers now in Japan include E. J. McGrew of Madigan-Hyland; Gustavus Auer and George Lowe of Sanderson and Porter; John Damon, Jackson and Moreland; J. E. Moore and George M. Henderson, both of Ebasco Services, Inc.; Ralph R. Crippen and King A. Harvie, both of American Appraisal Co.; Walter F. Kleine, Standard Research Consultants; Gustavus A. Myer, F. H. McGraw Co.; and Edwin H. Godfrey, consulting engineer.

The special study will cost about $750,000. It is aimed at determining how much industrial capacity Japan can afford to give up in the way of reparations and what is must keep to be self-supporting.

In carrying out the investigation the men sent to Japan will break up into sections to study parts of Japan's economy. These sections will include: Steel, chemicals, machine tools, power, shipbuilding, petroleum, primary war facilities, evaluation, and aluminum and magnesium.

### FLOOD DAMAGE ESTIMATED

Total flood damage for the entire Mississippi basin above Cairo, Ill., exclusive of the Missouri and Illinois river basins, according to Col. Clark Kittrell, division engineer, Upper Mississippi Valley Division, Corps of Engineers, is as follows:

Estimated total tangible damage, exclusive of soil erosion, $62,000,000; 955,000 acres flooded, including 340,000 acres behind protective works of varying degrees of effectiveness—all deficient for this flood; nine U. S. Highways and 23 state highways blocked; 14 railroad lines interrupted; and two water supply and four electric power plants forced out of service. Over 500,000 acres, however, were protected from flooding by existing works—thus preventing an estimated direct property damage of over $120,000,000.

## Herring heads planning, N. Y. Port Authority

Frank W. Herring of Washington, D. C., has been named chief of the Port Planning Bureau of the Port of New York Authority, it was announced here by Howard S. Cullman, chairman of the authority.

F. W. Herring

Mr. Herring will be responsible, under Walter P. Hedden, the Authority's director of port development, for planning and economic studies. He will fill a post formerly held by James C. Buckley, airport development director.

A former commander in the Navy Bureau of Yards and Docks, Mr. Herring also has been executive director of the American Public Works Association and deputy chairman of the facilities committee of the War Production Board. At one time he was assistant editor of *Engineering News-Record*.

He was graduated from the School of Engineering of Johns Hopkins University. His career in public service began when he became a field engineer for his native city of Baltimore, Md.

## Burst water main floods New York City street

On Sunday, Aug. 17, a 48-in. water main under the pavement at West 85th Street and Central Park West, New York City, burst with a roar and sent great torrents of water through four blocks for more than two hours. The damage included flooded cellars, torn up pavement, and the blocking of traffic. Gas supply had to be cut off from four houses on Columbus Avenue.

After an inspection of the cracked cast-iron pipe six feet below street level, water supply officials said that they could not explain the break. Workmen found a triangular piece about 3 ft. wide at the base and 4 ft. long separated from the huge cast iron-pipe. Two days were required for repairs.

## Ferguson Co. to build Brookhaven atomic pile

Work commenced Aug. 11 on an air-cooled atomic pile and associated facilities at Brookhaven National Laboratory for atomic research on Long Island, N. Y. The plant will be built for the U. S. Atomic Commission by the H. K. Ferguson Co., industrial engineers and builders, at a cost of about $10,000,000.

## Surveying and mapping

(*Continued from page 70*)

velopments and how they may be applied to surveying and mapping work. This was by S. W. Seeley, director, industry service laboratory, Radio Corporation of America. After discussing the fundamentals of radar procedures for measuring distances, Mr. Seeley declared that the electronics devices now available should be taken over as important tools of the surveyman and mapmaker.

### Wright is new president

Marshall S. Wright, technical assistant to the chief, Office of Plant and Operations, Office of the Secretary of Agriculture, was elected president of the congress for the coming year. He succeeds Capt. Frank S. Borden of the U. S. Coast and Geodetic Survey. Because Captain Borden was unable to return from his present work in the Pacific, and since Mr. Wright was in England on a special mission, George D. Whitmore of the Washington office of the Geological Survey and a past president of the congress, acted as general chairman at the meeting.

M. S. Wright

Until an entirely new slate of officers can be elected under the new constitution, Walter S. Dix of the Tennessee Valley Authority will continue as acting secretary and Richard T. Evans of the U. S. Geological Survey as treasurer, and Aaron L. Shalowitz, Coast and Geodetic Survey, will also continue as editor of *Surveying and Mapping*, the official publication of the congress.

## MAJOR MEETINGS

**American Association of State Highway Officials**, 33d annual meeting, Waldorf-Astoria Hotel, New York City, Sept. 22-26.

**Associated General Contractors of America, Inc.**, fall meeting, Savery Hotel, Des Moines, Iowa, Sept. 28-Oct. 1.

**Institute of Traffic Engineers**, 18th annual meeting, Hotel Fort Shelby, Detroit, Mich., Oct. 1-4.

**American Society of Civil Engineers**, fall meeting, Roosevelt Hotel, Jacksonville, Fla., Oct. 13-17.

**American Welding Society**, annual meeting, Sherman Hotel, Chicago, Ill., Oct. 20-24.

**Engineers' Council for Professional Development**, 15th annual meeting, Mount Royal Hotel, Montreal, Canada, Oct. 24-25.

# Earnings reach an all time high for N. Y. state construction workers

### Employment is also up, while union wage rates in building trades make record gain through the country

Average weekly earnings in the construction industry in New York State in June were $69.82, the highest ever recorded, according to a report submitted to Industrial Commissioner Edward Corsi by Milton O. Lowsen, executive director of the state division of placement and unemployment insurance.

June also brought a 3.5 percent increase in employment in the industry; the report shows that construction contractors employed 177,500 workers as compared with 171,500 in May and 152,800 in June of last year. Also, the work week was longer — 38.3 hours as compared with 37.3 in May.

Greatest increases in employment and in earnings were for employees of special trade contractors, such as plumbers, painters, plasterers, carpenters, electricians and other building trades. In this branch of the industry, employment rose 4 percent from 94,000 in May to 97,800 in June, average weekly earnings were $76.33, and the average work week was 37.9 hours.

General building contractors who construct residences, industrial, farm and public buildings increased employment 2.7 percent, from 49,500 in May to 50,800 in June. The average work week was 37.4 hours, and average wages, $64.33. Employment in this branch of the industry a year ago was 47,300.

General contractors on other types of construction such as highways, streets, bridges, sewers, railroads, tunnels, etc., employed 28,900 workers, a 3 percent increase over the May total of 28,000. The average work week was 40 hours and weekly earnings averaged $66.10. Employment in this branch was 22,200 in June a year ago.

For the industry, as a whole, wages were higher on privately financed projects; $70 for 38.1 hour week as compared with earnings on publicly financed projects of $84.85 for a 37 hour week.

In New York City average earnings in the industry rose from $72.63 in May to $73.39 in June, and the work week increased from 36.3 to 36.8 hours. Outside New York City, average weekly earnings increased from $61.82 in May to $65.19 in June, and the work week increased from 37.5 to 38.8 hours. A year ago, in June 1946, average weekly earnings in New York City were $60.87 for a 33.9 hour week and outside the city were $55.11 for a 38.1 hour week.

### National figures also show gains

Wage rates of union workers in the building trades advanced 15 percent between July 1, 1946, and July 1, 1947, the largest gain in a single year since 1920, according to preliminary estimates released by the Bureau of Labor Statistics of the U. S. Department of Labor. This increase amounts to about 25 cents an hour in the basic pay scale of nearly 500,000 union tradesmen in 7 principal construction classifications. Standard working hours have shown little change during the year.

Higher hourly rates of pay in most trades were negotiated after the removal of wage controls by Executive Order 9081, November 9, 1946. During the control period, July 1942 until November 9, 1946, however, union pay scales had increased by only 18 percent. The total increase over the 8-year period between July 1939 and July 1946 amounted to approximately 49 percent. During this same 8-year period, the Bureau's consumers' price index increased by 59 percent and the average primary market (wholesale) prices of building materials by approximately 96 percent.

An 18 percent rise for plasterers and plumbers was the largest gain achieved through collective bargaining between 1946 and 1947 in the 75 cities surveyed. Although bricklayers, with an estimated average hourly rate of $2.37, are still at the top of the wage ladder, plasterers in New York City have negotiated the highest rate—$3.00 per hour, a 75 cents increase since July 1, 1946.

### Workers increase 55,000 in July

Employment by construction contractors totaled 1,817,000 in July, an increase of 55,000 workers from June, according to preliminary estimates of the Bureau of Labor Statistics of the U. S. Department of Labor. The increase was due to moderate seasonal gains in employment on privately financed residential and farm construction (including new and repair work) and on public highway and conservation and development work. Employment exceeded the July, 1946, level by 190,000. Construction actvity was 16 percent above the level of July, 1946.

## NEWS IN BRIEF

*In telegraphic form, here are latest news developments on the engineering and construction front during the week.*

**Construction**—Temple & Crane, Inc., Boston, Mass., have a management contract to build a large new plant for Kingsbury & Davis Machine Co. at *Contoocook, N. H.* . . . *Fort Lauderdale, Fla.*, will sell $4,000,000 bonds for a recreation project on the Coast Guard base property . . . Work starts soon on a $1,000,000 Coca Cola bottling plant on South Jefferson Davis Parkway, *New Orleans, La.* . . . An Eastern Airlines maintenance building at *Miami, Fla.*, will cost over $1,000,000 . . . Work will start this fall on a building for the state school for the blind at *Kansas City, Kan.* . . . Completion of a $3,000,000 plant for Monsanto Chemical Co. at *Monsanto, Ill.*, has been announced . . . Construction starts soon on a $1,000,000 recreation center and market at *Santa Clara, Calif.* . . . Corps of Engineers is completing a 4-mile dike around the municipal airport of *Provo, Utah* . . . First contract in a $4,000,000 construction program by the Mountain States Telephone & Telegraph Co. in *Tucson, Ariz.*, has been awarded to M. M. Sundt Const. Co. . . . Work has started at *New Orleans, La.*, on pile driving to increase the size of the municipal beach eightfold . . . Central Kansas Power Co., *Hays, Kan.*, will start soon a $1,500,000 expansion program . . . L. Bamberger & Co. will build a $2,000,000 warehouse in *Belleville* and *Bloomfield, N. J.* . . . South Carolina Public Service Commission has approved a financial plan of the Duke Power Co. for a $60,000,000 construction program in the *Carolinas* . . . To cost about $25,000,000, a rayon yarn plant for American Enka Corp. is being built by The H. K. Ferguson Co. near *Morristown, Tenn.* . . . Planning board of *Boston, Mass.*, has recommended the construction of a $3,000,000 truck terminal. . . . A $2,000,000 first step in an expansion program for Thomas A. Edison, Inc., has been announced—storage battery plants at *West Orange* and *Silver Lake, N. J.* . . . A $379,000 building will be erected in *Philadelphia, Pa.*, for Pennsylvania Sugar Co. . . . Plans are approved for a $2,500,000 library for Washington State College, Pullman, and a $1,630,000 ward building at Eastern State Hospital, *Medical Lake* . . . International Paper Co. will spend $1,450,000 in next two years to modernize its plant at *North Tonawanda, N. Y.* . . . Bids are to be asked soon for an administration building at the N. Y. State School for the Blind at *Batavia, N. Y.* . . . . *Harris County, Tex.*, by the end of the year will have spent about $1,500,000 in flood control projects . . . Work has begun on a $2,766,000 chemistry building at the University of Illinois, *Urbana* . . . Plans have been prepared for a large classroom and laboratory building for textile engineering at Georgia Tech, *Atlanta, Ga.* . . . Building permits at *Houston, Tex.*, for July were $6,130,952—about six times greater than for July, 1946 . . . Consumers Power Co., *Jackson, Mich.*, is planning to spend $100,000,000 through 1949 on improvements . . . A $500,000 wing will be added to St. Mary's Catholic Hospital, *West Palm Beach, Fla.* . . . *Connecticut* has a $7,000,000 program for mental hospitals . . . Edward J. Noble, head of American Broadcasting Co. and Lifesavers, Inc., who was born in *Gouverneur, N. Y.*, has given $300,000 to that town for a hospital and citizens have matched it with another $300,000.

**Highways**—*N. Y. State's* highway construction program through 1960 will cost more than $2,000,000,000 says Charles H. Sells, superintendent of the Department of Public Works . . . More than $35,000,000 in highway construction is now under way in *Virginia* . . . *Maryland* will plan expenditure of $163,000,000 for state roads to integrate with a new federal network of highways proposed for the state . . . State Public Utility Commission approval has been given to a $5,872,500 highway improvement project to be carried out by Allegheny County, Pa., in *Glassport, McKeesport*, and *Dravosburg* . . . Construction on *Massachusetts* highways amounting to $22,000,000 will be under way next spring, according to W. H. Buracker, public works commissioner . . . In the first seven months of this year *Kentucky* awarded $15,407,120 worth of road contracts . . . *North Carolina* has begun preliminary plans to widen and straighten Highway 74 from Rutherford County line east to King's Mountain at a cost of about $1,000,000 . . . Gasoline tax revenue will finance $1,225,000 of road and bridge construction in *Broward, Suwannee* and *Highlands counties, Fla.* . . . *Washington* state has 141 road jobs under contract amounting to $16,626,583 . . . *Manitoba* is busy on a $5,250,000 road construction and repair program. . . . An underpass and traffic circle will be started this fall in the Charlestown section of *Boston, Mass.*, costing $1,750,000 . . . Governor R. G. Bradford, of *Massachusetts* says that the more than $30,000,000 now available for the federally-aided state highway program will be put to work by the end of next year . . . *Ohio* department of highways hopes to award 110 more contracts costing about $23,000,000 before the end of the year . . . On August 1, the *Texas* State Highway Commission authorized 47 road projects costing $5,268,734 . . . The new parking authority of *Pittsburgh, Pa.*, has an extensive program to solve local traffic problems . . . *North Carolina's* road construction and improvement program reached an all time high of $33,000,000 expenditure for the first six months of this year . . . A $40,000,000 bond issue for building of *Alabama* highways is being proposed by the State Highway Department and it is reported that more than 50 legislators approve . . . Primary grading has been completed and bituminous paving starts soon on six miles of Yellowstone Park highway north of *Pocatello, Ida.*, Carl A. Nelson Construction Co., Logan, Utah, has the contract at approximately $89,500. Meanwhile, work is being rushed to the paving stage on seven miles of U. S. Highway 30, west of *Lava Hot Springs, Ida.* The curve-straightening project is to be completed in September.

**Housing**—Earl R. Lippincott Co., Camden, N. J., will build a $2,000,000 apartment development at *Pennsauken, N. J.* . . . Work starts soon on two apartment houses of 24 units each at *Hays, Kan.* . . . A $1,930,000 development of 193 homes on a 10-acre site has been launched at *Houston, Tex.*, by W. F. Wisdom and C. B. Faulkner, and in the same city J. E. Leicher will build 60 homes . . . Near MacDill Field, *Tampa, Fla.*, 48 homes are under construction . . . Clayton Manufacturing Co., *Rosemead, Calif.*, plans to build homes for its workers . . . Permits for 44 multiple dwelling units were issued in June at *Louisville, Ky.*

**Sewers and water supply**—City council of *Los Angeles, Calif.*, has instructed City Engineer Lloyd Aldrich to prepare specifications for $10,000,000 worth of sewer projects for early bidding . . . *West Elmira, N. Y.* will prepare plans soon for $1,200,000 worth of sanitary and storm sewers . . . Bids have been received for a $500,000 relief sewer system for the northwestern section of *Fort Wayne, Ind.* . . . *Chester, Pa.*, is about ready to go on with its $9,000,000 water supply project from Octoraro Creek . . . *Bloomington, Ind.*, using 2,500,000 gpd. of water expects to expand to 3,000,000 this fall . . . *Burlington, N. C.*, city council has called a special referendum Sept. 9 on the proposed issuance of $1,150,000 in bonds for the extension of water and sewer lines.

## Reclamation Bureau

(*Continued from page 69*)

construction of part of two transmission lines and start of work on a tapline, $40,380,000 (assuming supplemental appropriation of $10,000,000). Kings River: examination and surveys together with negotiation of repayment contracts to go ahead, $170,000. All-American Canal, Imperial division: repairs to dam and desilting works, $340,000; Coachella division: construction of main canal, as modified start of distribution system in Coachella Valley and flood protection $6,150,000.

Colorado—Mancos Project: construct Jackson Gulch Dam, $1,680,000. Paonia Project: complete land classification; economic surveys; start Spring Creek Dam; surveys and design work on canal system; $320,000. San Luis Valley: prepare Platoro Dam specifications and investigational and development work, $240,000.

Colorado-Big Thompson: continue construction on Granvy reservoir and pumping plant, Horsetooth reservoir and feeder canals; Estes Park aqueduct and power system; start Olympus Dam; build transmission lines, $18,320,000 (assuming supplemental appropriation of $6,300,000).

Missouri Basin Project: start Narrows Dam construction $300,000 and start Bonny Dam, $800,000.

Idaho—Resume Anderson Ranch Dam work on full schedule to limit of funds, $3,370,000. Construction on Cascade Dam, clearing of reservoir site and highway relocation, canal and lateral construction, $4,175,000. Initiate reconstruction of existing irrigation system of Lewiston Orchards Project, $500,000. Construction on canal and laterals of Minidoka Project, $500,000.

Idaho-Wyoming—Continue detailed engineering and geologic investigations and explorations and development studies of Palisades Dam and initial construction, dependent upon obtaining certain water-saving agreements, $780,000.

Kansas—Start Cedar Bluff Dam construction of Missouri Basin Project, $900,000.

Montana—Start Hungry Horse Dam, award turbine and generator contracts, $2,900,000. Survey and design studies on drainage facilities of Sun River project, $30,000. Initiate construction of Canyon Ferry Dam, $600,000. Start Moorhead Dam, $900,000. Work on irrigation system of Yellowstone pumping unit, $200,000. Construction on Glendive-Miles City and Fort Peck-Williston transmission lines, and substations, $3,160,000. Irrigation pumping plant and drainage system of first division of Buffalo Rapids Project, $70,000 Additional work on pumping plant and canal system for Shirley and Terry units and the Fallon unit of the second division of Buffalo Rapids Project, $120,000. Additional work on main canal system of Buford-Trenton Project, $130,000.

Nebraska—Construction of Box Butte Dam and canals of Mirage Flats project, $190,000. Irrigation facilities of Bostwick unit of Missouri Basin project, $500,000, and work on irrigation facilities and Enders, Medicine Creek and Culbertson reservoirs of Frenchman-Cambridge Project, $6,400,000.

New Mexico—Construction on canal and drainage system of Carlsbad job, $40,000. Complete canal and laterals for first five units of Tucumcari Project, $1,790,000.

New Mexico-Texas—Complete Elephant Butte Spillway, construction of transmission line and substation of Rio Grande Project, $1,480,000.

North Dakota—Start of construction on Heart Butte Dam and Dickenson Dam, $700,000, and start Cannonball Dam construction, $400,000.

Oklahoma—Complete main canal and work on laterals and drainage system for W. C. Austin Project (formerly Lugert-Altus), $2,960,000.

Oregon—On Deschutes Project continue clearing Crane Prairie reservoir and construction of North Unit division, including Wickiup reservoir; river channel improvement; complete canal and work on laterals. Emergency rehabilitation of Arnold Irrigation District siphon, $3,400,000. Complete work on Owyhee canal system, $900,000. on Klamath Project, complete A-Lums pumping plant and construction of canals and other irrigation facilities and flood protective works, $1,680,000.

South Dakota—Continue Angostura Dam construction, and start irrigation construction, $3,900,000. On Grand River Unit start Shadehill Dam, $800,000. Start Bixby Dam, $500,000.

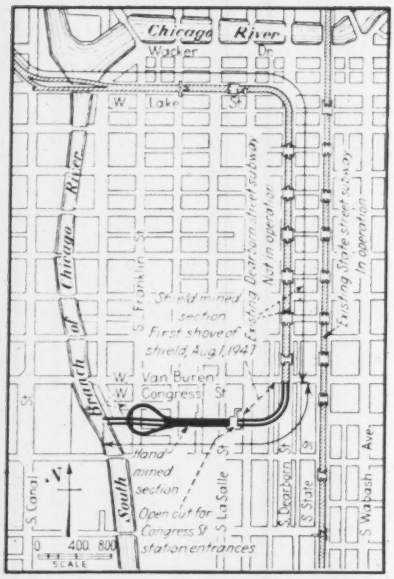
Texas—Preconstruction surveys and preliminary designs for Valley Gravity Project, $250,000. Minor construction at Marshall Ford Dam, $80,000. Complete protective works and other construction of Balmorhea Project, $70,000.

Utah—Complete Newton Dam and reservoir, $50,000. Continue construction on South Ogden District lateral system, $55,000. Construction on Salt Lake Aqueduct and Jordan Narrows siphon, $1,370,000. Additional work on Scoffield Dam, $40,000.

Washington—Continue pump and lateral construction on Roza Division of Yakima Project, $3,050,000 (assuming supplemental appropriation of $250,000). On Columbia Basin Project, no new contracts, but all existing contracts will continue until funds are exhausted; complete installation of three generating units in left powerhouse and work on auxiliary features such as switchyard; continue construction of Potholes reservoir and the main canal system including Long Lake reservoir, $32,000,000 (assuming supplemental appropriation of $10,750,000).

Wyoming—Continue Boysen Dam, $2,600,000. Continue Kortes Dam, $3,400,000, and start Keyhole Dam, $200,000. Canal system construction and work on drainage system of Riverton Project, including development of 15,000 acres of irrigable lands for settlement, $2,185,000. Canal laterals and transmission line and development of 15,000 acres on Heart Mountain division of Shoshone Project, $3,150,000. Continue work on canal and laterals of Kendrick Project, $1,040,000.

In addition to dam construction, Missouri River Basin funds include $4,800,000 available to regions 6 and 7 to complete detailed investigations and preconstruction work to bring new units to the construction stage. Missouri Basin program also includes $2,600,000 for construction of transmission lines.




*FINAL WORK STARTS on Chicago subway —On August 1, the S. A. Healy Co., Chicago, and Peter Kiewit Sons Co., Omaha, joint venturers, made the first shove of the shield to be used in building about one-third of 2,271 ft. of double tubes included in their $8,235,000 contract for the final downtown section completing the Milwaukee Ave.-Dearborn St.-Congress St. subway. The contract envolves also 1,084 ft. of single-tube turn-around loop. Commissioner Virgil E. Gunlock, head of the department of subways and superhighways, hopes to finish the final section and have the entire route ready for service in 1949. At the north (outer) end of the underground twin tubes, the ramp connection from the subway to the elevated rapid transit tracks have been completed.*

*Work on the final (Congress St.) section is being performed under a cost-plus, share-the-savings contract which protects the city against any costs in excess of the low bid of $8,235,134. As incentive for completing the work at less than this amount, the contract provides for payment to the contractor of cost plus 10 percent plus one-half of the savings between the actual cost and the low bid.*

## Random Lines *from an editor's notebook . . .*

***. . . In which the western editor takes a boat trip to view proposed work on the Calumet-Sag channel.***

It was a perfect afternoon from a weather standpoint when Col. W. P. Trower, Chicago district engineer, Corps of Engineers, recently played host to a group of 40 officials on an inspection trip by boat through 65 miles of navigable channels of the Port of Chicago. High point of the day's activity was a look-see traverse through the Calumet Sag channel, which Congress in 1946 authorized for widening to 225 ft. from its present 60 ft.

Engineering work already has started on preparation of plans for four of the railroad bridges which have to be rebuilt to greater horizontal and vertical clearances to accommodate the enlarged channel, Col. Trower explained.

The Calumet-Sag Channel, center of interest during the day's trip, is a man-made canal about 16 miles long connecting the Sanitary and Ship Canal with the Calumet River, affording access both to Lake Calumet (in the south part of Chicago) and to Lake Michigan. The Sanitary and Ship Canal forms part of the main stem of the Illinois Waterway, which provides a 9-ft. navigable channel from the point where Lake Street crosses the South Branch of the Chicago River, adjacent to the Loop, for a distance of 325 miles to the mouth of the Illinois River at Grafton. As a branch of this system, the "Sag" serves an important industrial district and carries 1,000,000 tons of barge traffic per year.

Plans for the Calumet Sag project are now being prepared by the Chicago District. The project as a whole will provide an adequate channel for barge traffic to serve the industrial areas from South Chicago to Gary. In addition to the improvement of the channel, the project calls also for opening up the Grand Calumet River (a branch of the Calumet) to similar dimensions from its mouth to the Indiana Harbor Canal at 141st Street, Chicago, with an extension along the Grand Calumet River to Clark Street in Gary, Indiana.

All obstructive railroad and highway bridges are to be altered by local authorities to provide adequate vertical and horizontal clearances.

For purposes of simplification and orderly priority, the work under the authorized project is divided into two sections. Section 1, the first on the schedule for planning and building, includes all work on the 16-mile length of the Calumet Sag Channel. Money for engineering activities on this section comes out of Congressional appropriations for new work on the Illinois Waterway Project, which for the last fiscal year received about $300,000. Of this sum, roughly $280,000 was obligated for specific engineering preliminaries on the Calumet-Sag Channel.

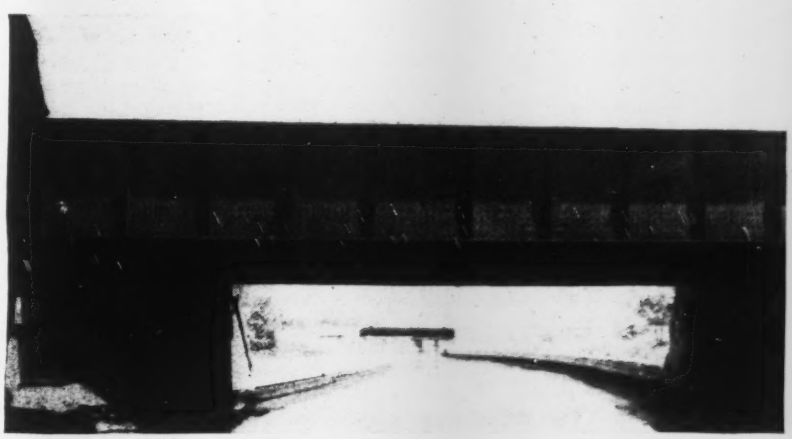
### *Bridge contract*

Most substantial among these engineering commitments was the drawing up of a continuing form of contract with Sverdrup and Parcel, consulting engineers, St. Louis, for the design of four railroad bridges which cross the channel in the town of Blue Island. Because of the problems to be worked out in establishing new grades for these railroads, which have junctions and intersections at varying, relatively short, distances from the canal, the first item under this contract is the design of the bridge approaches, though the initial award includes also the design of one of the four bridges. The contract covers the plans and specifications for all four bridges and related construction. As funds become available the Chicago District will award other items for design of the bridges under the contract.

On the inspection trip, the party passed under a total of 36 bridges crossing the Calumet-Sag Channel. With one possible exception, all of these bridges would have to be removed or replaced. Eleven of the bridges are railroad structures which would be replaced by the Federal Government, while all others would have to be paid for by local interest, under present provisions of the act.

Section 2 of the project will have to await completion of the work on Section 1. The Calumet Sag Channel extends as far east as the head of deep draft navigation in the Calumet River, at the mouth of Lake Calumet. Considerable initial work has been done toward making Lake Calumet into an interchange harbor for transfer of commodities between rail, truck, barge and lake vessels. The federal government dredged the channel connecting a turning basin in the Calumet River with the lake and extended this connection by dredgeing a channel 3,200 ft. long, averaging 700 ft. in width, at the south end of the lake. As a part of the required local cooperation, the City of Chicago has constructed a bulkhead 720 ft. long on the dredged channel; the city plans to develop and operate an interchange harbor and to promote use of land surrounding the lake as deep water industrial property.

Between Lake Calumet and Lake Michigan, the Calumet River has a dredged channel with an average width of 200 ft. and a minimum depth of 21 ft. Some widening and straightening of the river remains to be done. Much of this work depends upon local interests, which are required to furnish the necessary rights of way. Three closely-grouped railroad bridges at one point along the river are said to cause unreasonable obstruction, and a report on these bridges has been prepared by the Chicago District and forwarded to the Chief of Engineers. . . . *V.B.S.*



***Bridges Out**—Railroad bridges like these two (seen from the nose of Navylent launch) will be rebuilt to required horizontal and vertical clearances at the expense of the federal government, when widening of Calumet-Sag channel brings it to 225 ft. instead of the present 60 ft.*

# ENGINEERING SCHOOL NEWS

***New chairman of civil engineering at Michigan—$250,000 a year for experiment station at Texas A. & M.—M.I.T. can take less than one-fourth of applicants this fall***

Ernest Boyce, who went to the University of Michigan three years ago as professor of sanitary engineering in the college of engineering and professor in the school of public health, has been appointed chairman of the civil engineering department of the school.

Professor Boyce was graduated in civil engineering at Iowa State College, taking his professional civil engineering degree there and a master of science degree in sanitary engineering from Harvard. In 1920 he went to the University of Kansas as assistant engineer for the State Board of Health, and in 1924 was appointed chief engineer and director, division of sanitation, Kansas State Board of Health. After 1941 he was on leave of absence as water supply consultant to the Quartermaster General and, later, as senior sanitary engineer for the U. S. Public Health Service.

Nearly $250,000 per year for the next two years has been appropriated by the state legislature for research and administration of the Texas Engineering Experiment Station. The research will be in sanitary engineering, aerodynamics, electronics, soil mechanics, petroleum production, chemical engineering, mechanical engineering, chemurgic research, cottonseed products research, industrial surveys, and architecture. This will be supplemented by an equal or greater amount from the Texas A. & M. Research Foundation. A. A. Jakkula has resigned as vice-director of the station to become executive director of the foundation.

At Massachusetts Institute of Technology, out of 4,200 applicants only 900 will be accepted this fall. About one-fourth are veterans. The total enrollment at the institute will be 5,300, about normal. The same conditions exist at Harvard, Tufts and other New England colleges having engineering schools.

A minimum of five year's college for the first engineering degree is among the aims of the National Society of Professional Engineers. Alex Van Praag, Decatur, Ill., vice-president, told engineering groups in Salt Lake City recently. Mandatory examinations before an appropriate board as a condition to practice is another goal of the society, said Mr. Van Praag.

The University of Buffalo, N. Y., will start at once to complete its engineering building. Construction of two wings will fulfill the original plan for the building, since the center section was finished last spring and is now in use. The school, established in 1945, has had nearly 1,100 students during the last year and will enroll an even larger number in the fall.

A department of drawing, mechanics and design has been established in the school of engineering, with John A. Beane as professor of mechanics and chairman of the department. Chancellor Samuel P. Capen said the new development is required by the extraordinary growth of the school.

Experiments carried on by the Georgia Tech engineering experiment station, Atlanta, reveal that 2-coat paint systems applied to Southern yellow pine are practically equivalent to the best 3-coat systems provided proper primer-topcoat combinations are selected. The 6-year experimental study has been released by Leonard Wilkins and Paul Weber of the Georgia Tech station.

George H. Harding of Cincinnati will become a full professor in Ohio State University's college of engineering Oct. 1. Professor Harding took his bachelor's and professional degrees from the university. He taught from 1929 to 1940 at the University of Louisville. During the war he was a lieutenant colonel in the Corps of Engineers.

Last month, Worcester Polytechnic Institute concluded its accelerated program and the faculty had its first vacation in six years. In the coming year the number of students, of which nearly 75 percent are veterans, will be 25 percent in excess of normal or about 875. About 60 percent of the freshman class will come from secondary schools. These have been long denied an opportunity for a college education because of veteran impact. About 600 qualified applicants could not be accepted for this class, which is limited to 200. Last year the teaching staff was increased from 70 to 90. An endowment campaign for $1,250,000 to improve existing facilities, is under way. This will provide for an increased faculty salary schedule; a new engineering laboratory; and a modernized science building.

The department of geology at Texas A&M College has been transferred from the school of arts and sciences to the school of engineering. Headed by S. A. Lynch, it currently employs 5 full-time and 9 part-time instructors and there are 175 students who have chosen geology as their major. A new curriculum in geological engineering, a 4-year course, will be started this fall following standard engineering-course lines. Truman R. Jones, captain in the Corps of Engineers in Hawaii, will be separated from the service in time to become an instructor in civil engineering at A&M in September.

Ground has been broken for the Industry Engineered Homes being built at the University of Illinois to develop methods of reducing the cost of home building. Six of the engineered homes will be built in succession under the supervision of the university's Small Homes Council, and time and motion studies will be conducted to determine methods of saving time in the handling and assembly of materials on the job. The project, which is being conducted with the aid of a grant of $45,000 from the Office of Technical Services, U. S. Department of Commerce, will be one of the most comprehensive studies ever made on the cost of homes.

Charles C. Spencer has been appointed assistant professor in the school of public health, Columbia University, and will teach public health engineering. Mr. Spencer served four years as a sanitary engineer with the U. S. Public Health Service and for two and one half years in the Sanitary Corps, U. S. Army, assigned to Brazil, and later to the First Army at New York. Previous to joining the Public Health Service he was connected with the Dorr Co. and with Greeley and Hansen, consulting engineers. He is a civil engineering graduate of Cornell University.

## OBITUARY

**Leonard A. Lawrence,** 66, an associate professor in Cornell University's school of civil engineering, died recently in Ithaca, N. Y. He had been a member of the engineering faculty for 40 years.

**Earl J. Sherwood,** 49, civil engineer and president of the Great Lakes Concrete Pipe Co. of Buffalo, N. Y., died recently. He formerly served as Buffalo district manager of the American Construction Co. and in July, 1929, became president of the pipe company and the district Improvement Corp.

**Henry Macy Jones,** 55, president of the Los Angeles section of the American Society of Civil Engineers in 1939, died July 18, at Balboa Island in Southern California. He was a graduate of Stanford University and had been associated with the Los Angeles County Surveyor's office for many years. Before his retirement in 1945 he was secretary of the California State Board of Registration for Civil Engineers.

**Archibald Fraser,** for many years on the engineering staff of the Canadian department of transport at Ottawa, died at Wolfville, Nova Scotia, Aug. 1.

**Norman T. Olson,** 63, regional land officer in the U. S. Bureau of Reclamation, died in Salt Lake City, Utah, July 23. A graduate of the University of Wisconsin, he had been associated with Department of Interior agencies for 26 years in Montana and Wyoming, and in Ogden and Salt Lake City. From 1938 to 1942 he served as engineer of the Bureau of Reclamation in charge of the construction of the pipe distribution system of the South Ogden conservation district.

**Joseph G. Tozer,** 54, died recently in Honolulu, T. H. He was a construction engineer in Beverly Hills, Calif., and formerly owned and managed the Beverly Hills Electric Co.

**Walter E. Tyler,** 58, for 38 years an engineer for the Boston & Maine Railroad, and connected with its valuation department, died recently at Lynn, Mass.

**Charles E. Halloran,** 54, construction superintendent of the John W. Cowper Co., Inc., Buffalo, died at Erie, Pa., recently where he was in charge of construction of a new General Electric building. One of the leading construction engineers in the Buffalo area, Mr. Halloran was promoted to superintendent shortly after joining the Cowper firm 13 years ago. He had supervised construction of the University of Buffalo engineering building and the U. S. Army's Pine Camp, Jefferson County, N. Y.

**Robert S. Meeker,** 93, a veteran of the New Jersey State Highway Department, died in Plainfield, N. J., Aug. 15. A graduate of Rutgers and Lehigh, in 1887 he helped prepare plans for a $400,000 bond issue to improve Union County roads. Afterwards he was Plainfield street commissioner until 1900 when he was appointed state supervisor of roads, and from 1915 to 1919 he was state highway engineer.

## Concrete underbids steel on N. Y. City housing

Bids were taken last week by the New York City Housing Authority for Lillian Wald Houses to be built on the lower east side of Manhattan. For general construction, separate bids were submitted for reinforced concrete and for steel skeleton frames.

HRH Construction Co. of New York City was low bidder with $11,389,000 for concrete and $12,269,000 for steel, including foundations. The bid on foundations alone was $2,607,000 for the concrete skeleton and $2,477,000 for the steel.

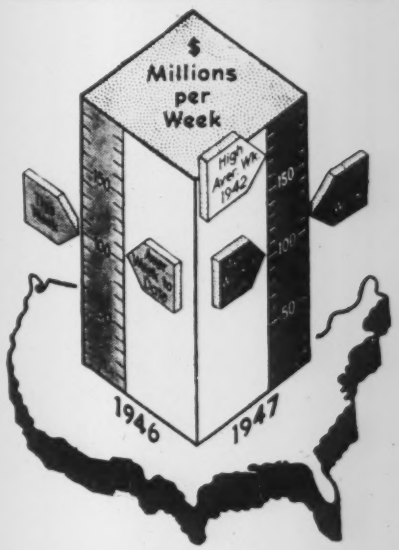
Five bids on general construction were received and in every case the total for concrete frames was less than for steel. Second lowest bidder, Cauldwell-Wingate Co., bid $11,784,000 for concrete and $12,714,000 for steel. Third lowest, Willcox Construction Co., Maurice L. Bein, N. Fish Construction Co. and James McHugh & Sons, jointly bid $11,891,000 for concrete and $12,829,000 for steel.

Jaroho Brothers, Inc., were low bidders on heating and ventilation with $896,164. Rao Electrical Equipment Co. on electric work with $523,997 and Eugene Duklauer, Inc., on plumbing with $1,599,750.

Lillian Wald Houses will provide 1,861 apartments in 16 ten to fourteen story buildings, which will occupy about 19 percent of a 15.9-acre site bounded by Franklin D. Roosevelt Drive, Avenue D, East 6th St. and Houston St. This is the tenth low-rent public housing project on the post-war construction schedule of the New York City Housing Authority, of which Thomas F. Farrell recently was appointed chairman.

( *News continued on page* 145)

## CONSTRUCTION ACTIVITY




As Reported this week to . . .
*Engineering News-Record*

### CONTRACT VOLUME

Continental U. S. Only
(Thousands of Dollars)

| | Week of Aug. 21 1947 | Cumulative 1947 (34 wks) | Cumulative 1946 (34 wks) |
|---|---|---|---|
| Federal ... | $2,117 | $433,318 | $483,037 |
| State & Mun. | 41,274 | 1,107,221 | 921,112 |
| Total Public. | $43,391 | $1,540,539 | $1,404,149 |
| Total Private | 65,991 | 1,934,115 | 2,201,787 |
| U. S. Total. | $109,382 | $3,474,654 | $3,605,936 |

### WHERE CONSTRUCTION ACTIVITY ORIGINATED THIS WEEK

Dollar Volume (Thousands)

| Type of Work | This Week | Cumulative 1947 (34 wks) | Cumulative 1946 (34 wks) |
|---|---|---|---|
| Waterworks .. | $2,153 | $71,937 | $67,250 |
| Sewerage ..... | 2,512 | 87,563 | 66,180 |
| Bridges ..... | 3,326 | 113,312 | 92,558 |
| Highways .... | 23,595 | 530,044 | 531,905 |
| Earthwork, Waterways ..... | 1,066 | 197,386 | 263,588 |
| Buildngs, Public | 8,854 | 367,307 | 259,772 |
| Industrial .. | 34,344 | 536,087 | 675,722 |
| Commercial | 29,124 | 1,127,539 | 1,398,656 |
| Unclassified ... | 4,438 | 443,479 | 250,304 |

NOTE: Minimum size projects included are: Waterworks and waterway projects, $22,500; other public works, $40,000; industrial buildings, $55,000; other buildings, $205,000.

### NEW PRODUCTIVE CAPITAL

| | Cumulative 1947 (34 wks) | Cumulative 1946 (34 wks) |
|---|---|---|
| NON-FEDERAL ... | $1,511,422 | $1,110,541 |
| Corporate Securit's | 522,299 | 314,387 |
| State and Municipal | 741,412 | 571,154 |
| Fed. Aid Highway | 247,711 | 225,000 |
| FEDERAL ..... | 818,729 | 1,714,695 |
| Total Capital ..... | $2,330,151 | $2,825,236 |

### ENR INDEX NUMBERS

| Index Base = 100 | 1913 | 1926 |
|---|---|---|
| Building Cost.....Aug.'47 | 313.03 | 169.21 |
| Building Cost .....Aug.'47 | 313.03 | 169.21 |
| Volume .....July '47 | 222 | 97 |

# EDITORIALS

VOLUME 139 NUMBER 8

August 21, 1947

## Housing Bids Raise Questions

IN ASKING FOR ALTERNATE BIDS for reinforced concrete and structural steel frames on one of its projects, the New York City Housing Authority received an unusually definite answer, but raised a number of questions. The definite answer is that every bidder would build the sixteen 10-14 story buildings of the Lillian Wald Houses for less money in concrete than in steel. (*ENR* Aug. 21, vol. p. 243). The amount less varies from about 5 to 9 percent. Where, from comes this differential favoring concrete? Is it merely a matter of relative prices of materials or do the reasons go deeper? Perhaps the technique of designing and constructing concrete structures has advanced to the point where buildings as tall as 14 stories can always seriously compete with structural steel. Stone concrete was specified for the fireproofing and floors of the steel frames of this project. How much less would the steel frame bids have been if cinder concrete had been permitted? Finally, a year ago, steel and concrete bids on the Authority's projects were about equal and at a lower figure than now. As unit costs go higher, does concrete improve its relative position? Estimators are in for a busy time.

## No Science Foundation

THE PRESIDENT'S veto of the bill creating a National Science Foundation probably postpones several years the centralizing of federal financing of scientific research and training. Although the veto comes as a surprise (an editorial in these columns, [Aug. 7, vol. p. 174] assuming the bill would become law), the President's rejection is not without good reason. He merely joined the camp of those who did not want to turn full responsibility for administering research over to the scientists. In explaining his position he pointed out that the bill departed "from sound principles of administration" in giving the Foundation functions that are "peculiarly within the scope of the President's duties—coordination of the work of executive agencies." Behind these words is something more than mere protection of personal prerogatives. Actually, they express concern over the possibility that the Commander-in-Chief would not be able to direct scientific work into channels that were deemed necessary in the interests of our national defense. They reveal the unresolved conflict of objectives in attempting to set up centralized research—whether for peace or for war. The scientific viewpoint has been that pure research has no such definite objectives, that its results are merely the raw material for applied research from which either industrial or military advances emerge. The military viewpoint, reflected by the President, is that a certain amount of direction is also necessary and useful in pure research. Until these viewpoints are reconciled there is not much hope for a National Science Foundation. In the meantime, much can be done toward improving existing programs of federal aid to science by eliminating duplication, establishing more consistent policy and preventing the waste of scientific manpower.

## Lessons in Flood Control

LIKE all other major floods in history, the recent 103-year record flood on the Mississippi adds another lesson in flood control which, if viewed objectively, should set the pattern for preventative maintenance of existing levees as well as the construction of new ones.

Viewed in retrospect, it took the 1927 floods to serve as a background for establishment of the Flood Control Act of 1928. Under the provisions of that act, such progress was made during the next nine years in the construction of flood-control works on the Lower Mississippi that the 1937 floods were carried safely to the Gulf without a single break in any major levee along that stretch of the river where the improvements had been made.

Not until 1936, however, was federal authorization secured for the construction of flood-control works on the middle section of the Mississippi, in the St. Louis area, on the basis of the government bearing the cost of construction, with local interests furnishing the necessary right-of-way and assuming the responsibility of maintaining all completed levees. By the time this construction program had gotten underway, all work necessarily was stopped because of the war.

Then came the two most severe floods in the previous 100 years—those of 1943 and 1944, with repairs being limited to the restoration of damaged levees only to their approximate previous grade and section. Following the war, the flood-control

program on the Middle Mississippi was resumed and some 20,000,000 cu. yd. of the total 78,000,000-cu. yd. of earthwork embankment proposed under the present program were incorporated in levee construction designed to furnish a 2-ft. freeboard for floods having a frequency of flow of ônce in 50 years. Thus, it is clear that the time available for completion of the flood-control program in the St. Louis area was woefully inadequate before that section of the valley was visited with the 1947 floods—which broke all records for the past 103 years.

Perhaps the most significant lesson of the recent flood is that the lack of proper levee maintenance during periods of non-flood, together with inadequate land access to endangered levees, handicaps the strengthening of the privately-owned, substandard levees during flood emergencies to the point that the battle is lost almost before it is begun. Federal requirements place the responsibility of all maintenance on government-constructed levees squarely upon the levee districts and other local interests. This maintenance has been adequate, but in other cases local interests rarely have demonstrated the capacity, or shown the foresightedness, properly to patrol and maintain the levees for which they are responsible. This negligence must be eliminated if we are to cope with the next major flood, even though it may not be of the 103-yr. variety.

Those closely connected with the over-all flood control program on the Mississippi and its tributaries are confident that the Pick-Sloan flood-control plan for the Missouri River, together with the present authorized plans for the construction of flood-control works on the Middle and Upper Mississippi will furnish adequate protection for the entire valley. The Army Engineers have the "know-how" to perform the job and, with the construction equipment now available, it is entirely within the realm of reality that the total integrated flood-control program can be prosecuted at a tempo sufficient to control all future floods.

In view of the lessons learned from the recent flood, both pending Federal legislation for emergency flood control and that needed for long-range planning should be re-examined as to the adequacy of funds authorized, and the urgency of appropriating funds and implementing the work, together with the development of a better program of maintenance for the privately-owned levees comparable to those built with Federal funds.

## Career in Sanitary Engineering

ECONOMIC JUSTIFICATION for the construction of a sewer system in Chungking, China is advanced on the basis that the savings in coffins, due to the reduced death rate, would pay for this sanitary improvement in 19 years. Here is a grim but dramatic example of the type of yardstick that a sanitary engineer found applicable in his work abroad. As reported in an interview with Col. A. B. Morrill of the U. S. Public Health Service, (see p. 94), who recently returned from six years service in China and India, it lends emphasis to the world-wide need for basic sanitation.

Sanitation costs money. But lack of sanitation is even more costly, as the Chungking experience so vividly portrays. It is not money alone, therefore, that is the principal determent to better environmental sanitation. The biggest handicap is a lack of appreciation—many times even in the highest places—that a nation's economic welfare is dependent on the health and vigor of its peoples.

The United States, coping with its international responsibilities, has already given some recognition to this fact. Cooperative programs in health and sanitation improvement have been successfully demonstrated by The Institute of Inter-American Affairs, our governmental agency operating in South America. At present the Greek and Turkish-aid programs are getting underway. All of this is opening new and vital opportunities for the application of sanitary engineering science.

But high as our aspirations may be in contributing to the success of this objective, they cannot be realized without an abundant supply of trained sanitary engineers. At this time when our universities are opening classrooms to a new group of students, it would seem appropriate for educators to encourage the appraisal of sanitary engineering opportunities. They should find no difficulty in pointing out that the most important health problems confronting the world are those relating to diseases subject to control by the sanitary engineer. What greater challenge and inspiration can be given a young man preparing for a career than the prospect of participating in their solution?

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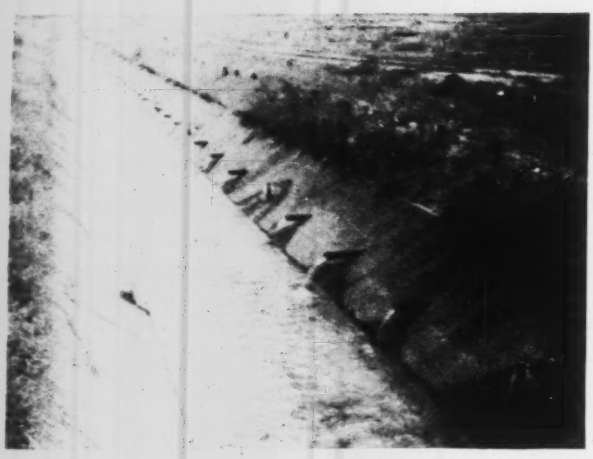


*Fig. 1. Vertical pipe wells (lower right) spaced at 25 ft. c. of c. to the original trench of Sardis Dam were supplemented in 1942 by additional vertical wells (with horizontal outlets) but this did not relieve pressure sufficiently.*

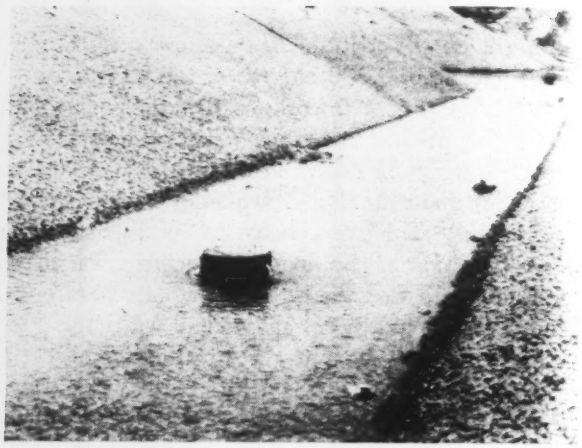


*Fig. 2. Vertical wood pipe wells 40-ft. deep were installed under the new trench to relieve uplift pressure at the downstream toe of Sardis Dam. This trench is lined with porous concrete to prevent erosion.*

# Vertical Relief Wells Reduce Uplift On Sardis and Fort Peck Dams

***Editor's Note:**—Excessive uplift pressures at the downstream toe of both Sardis and Fort Peck dams have been alleviated by installation of vertical perforated pipe drainage systems that go deep into the substrata to collect free water. The work has been done by the Corps of Engineers, U. S. Army, under general supervision of T. A. Middlebrooks, now in the office of the Chief of Engineers in Washington, who was associate engineer on Fort Peck Dam. The introductory section of the following was prepared by Mr. Middlebrooks; the descriptions of work at Sardis and Fort Peck was written by ENR editors with the assistance of Corps of Engineers personnel in the field.*

THE DRAINAGE SYSTEMS at Fort Peck and Sardis dams are excellent examples of a new and unique method of controlling underseepage which has been pioneered by the Corps of Engineers. This consists of installation of vertical relief wells into coarse underlying strata and allowing sufficient water to escape to reduce the uplift pressures to a safe value.

Conventional methods of controlling under seepage did not prove satisfactory at either dam and remedial measures had to be undertaken after the reservoirs had been filled. At Fort Peck Dam, sheetpiling driven to the unprecedent depth of over 150 ft. did not sufficiently reduce the foundation seepage to prevent dangerous uplift pressures at the downstream toe. At Sardis Dam, normal stratification of the pervious foundation did not allow sufficient water to enter the horizontal drain to prevent boils and high uplift pressures at the toe.

### Experimental wells give relief

As soon as the high uplift pressures became evident at Sardis Dam, an experimental relief well system was installed. Although inadequate in discharge capacity and depth of penetration, this system proved conclusively that an adequately designed system would give the desired pressure relief. Deterioration in a short time of the bronze well screens in the experimental installation showed that this problem was one of major concern in the permanent installation.

At Fort Peck Dam uplift pressures reached dangerous proportions during the extreme material shortage days of the war. A temporary relief-well system was installed using 6 and 8 in. plain black steel pipe, which was slotted to serve as well screens. Deterioration of the black pipe was anticipated, but some of the pipes failed in less than two years and cathodic protection was necessary to keep the system operating until a permanent installation could be made after the end of the war.

After investigation of numerous types of commercial well screens and pipes, it was decided that wood pipe would have the longest life since it would be submerged at all times. Wood pipes, perforated to form relief well screens, were included in the permanent system as described in the following articles.

This type of relief well drainage system has many advantages over the conventional types. It can be designed to effectively tap all the highly pervious strata, thereby reducing the uplift pressures at any desired eleva-

tion in the foundation. It is much more flexible since additional wells can be added if found necessary.

The cost is generally much less than any of the conventional types of drainage systems. The first few installations for gravel packed wells were quite high, $20 to $30 per linear foot; however; more recent installations (6 in. pipe with 6 in. gravel) have cost $10 to $15 per linear foot. It is anticipated that these costs may be further reduced as techniques are improved and contractors become familiar with this system.

Most of the contractors engaged in this work now are water-well contractors and are not equipped for mass production where a large number of wells are to be installed. It is anticipated that pile driving companies will become interested and that the cost of installation will approach the cost of cast-in-place piles.

## GRAVEL PACKED WELLS AT SARDIS DAM

Uplift pressures at the downstream toe of Sardis Dam, equivalent to 15 ft. of water above the ground elevation at a static head on the upstream side of only 45 ft., has forced installation of additional drain facilities costing nearly $500,000. Sardis is a flood-control project on the Little Tallahatchie River of the Yazoo River watershed.

The dam is near Sardis, Miss., some 60 miles south of Memphis, and was the third largest hydraulic fill dam in the world when built in 1938-1939 by the Corps of Engineers under direction of the Mississippi River Commission. (*ENR*, March 16, 1939, p. 376). The dam provides for 1,500,000 acre-ft. of flood storage at the crest, El. 282, of the uncontrolled spillway while the top of the dam is at El. 312 and general ground level downstream is at El. 220.

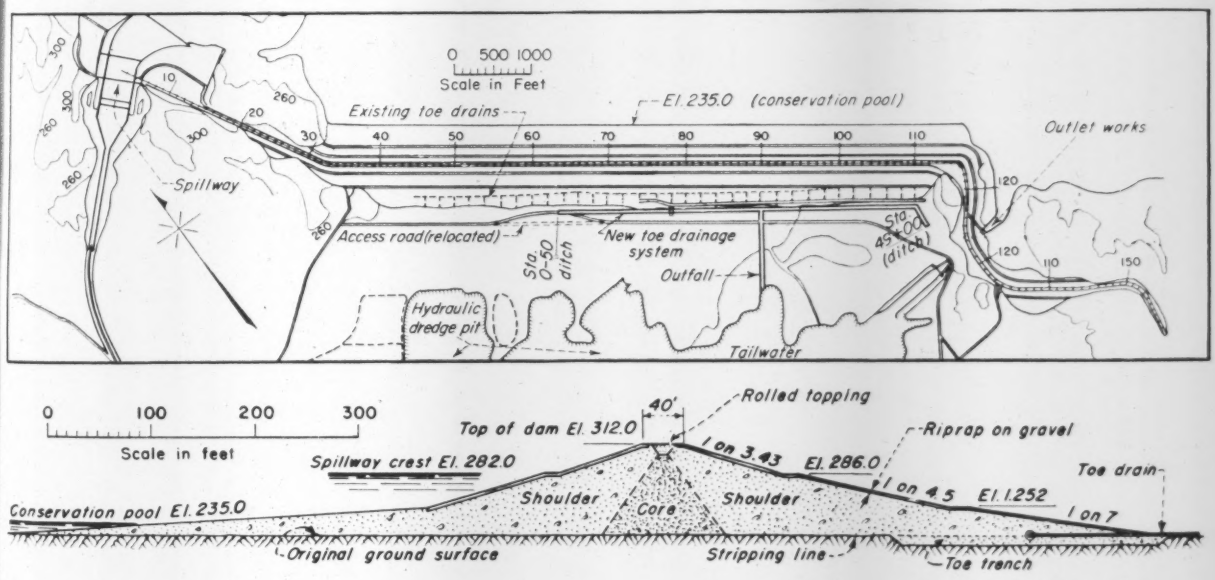
Although Sardis is exclusively a flood-control dam, only relatively slow outflow is permitted after floods as the stream channel below is restricted. Thus, a reservoir elevation of 265 or higher may continue for months. Experience with this water differential has been that there is little leakage near the northwest end of the dam but pressure builds up to equivalent of a 15 ft. static head at the bend of the dam near the outlet works. Fig. 2.

### Additions inadequate

In 1941, the toe drain system was augmented by addition of 117 vertical wells at 25 ft. centers with brass strainers put down to a depth of 30 ft. Transverse horizontal drains of 8 and 10 in. perforated concrete pipe were installed and these, with the original drains, were made to discharge into a concrete-lined open ditch. Due to the corrosive nature of the ground water, metal well screens and riser pipes have a relatively short life. The corrosive attack is unusual in that at one end of the line of metal vertical wells the brass strainers disintegrated in a short time while near the other end the strainers lasted satisfactorily but the wrought iron pipe failed.

During the summer of 1942 in a small area near Sta. 103 (Fig. 3) 48 experimental wells were installed on the downstream side of the open ditch and connected to the ditch by horizontal pipes to study the performance and life expectancy of various types of wells. At the time the picture in Fig. 1 was taken, a static head of 40 ft. existed at a distance of 750 ft. upstream on the opposite side of the core wall of the dam. Even after these installations had been made, free water continued to force its way out of the downstream face of the fill and through cracks in the concrete ditch, indicating that drainage measures were not adequate. Weep holes were drilled in the bottom of the concrete collection ditch but this could give only local relief.

Experiments indicated that drains




CROSS SECTION OF DAM AS BUILT

**Fig. 3. *A new downstream drainage system has been installed at Sardis Dam to relieve uplift pressure at the toe.***

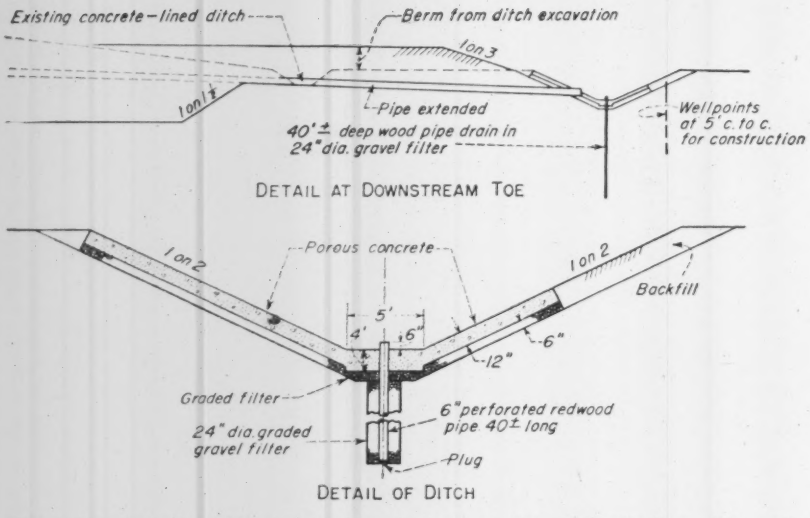



***Fig. 4. Relation of existing to new toe drainage system at Sardis Dam. The wellpoints were for construction only.***

to a considerable depth below the earth disturbed in construction of the dam would be helpful in reducing the uplift pressure and that a more adequate surface collection system also was necessary. To meet this requirement, an open ditch lined with porous concrete over a gravel filter blanket was recently constructed to drain the surface and dispose of water from the existing drains and from deep vertical drains being installed.

The vertical drains are 6 in. dia. and extend 40 ft. below the bottom of the trench to about El. 185. For permanency, the drains are of creosoted wood-stave pipe wrapped with steel brands, coated with asphalt and rolled in wood chips then drilled with $\frac{1}{2}$ in. holes at 3 in. centers each way.

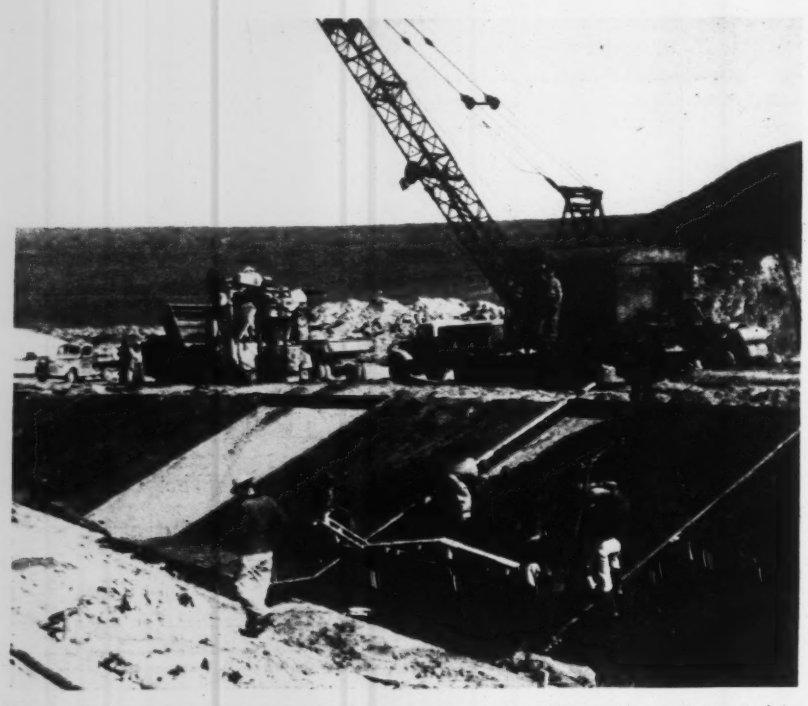


***Fig. 5. Porous concrete was mixed by a paver, placed by crane and leveled by a manually-held tractor-drawn screed. Note the wellpoints, used during construction, at lower left.***

The new open ditch was constructed downstream from the existing one to avoid disturbing the present system until the new one was ready to function. Specifications for construction require that wellpoints be used in such a way that all excavation could be done in the dry without disturbing the earth below the required lines of the present work with sheetpiles or other cofferdam material.

The most satisfactory position for the wellpoint header was found to be on the downstream side of the trench where it could be put 5 ft. below the present surface without interfering with the concrete lining. Here, 22 ft. long risers with 3 ft. points at 5 ft. centers readily drew all of the water out of the previously saturated fill to a depth of 30 ft. so that excavation could be carried on without difficulty. The trench for the open ditch was dug with a dragline that piled the material where it could be spread as a berm over the old ditch.

Sulphate resisting cement was used for all concrete. The porous concrete was made with one part cement to five parts of aggregate, all of a size passing a $\frac{3}{4}$ in. screen and retained on a $\frac{3}{16}$ in. screen.

The existing horizontal drains were extended to the new ditch. Where the drains enter the ditch, solid rather than pervious concrete was used. Openings were left in the trench bottom for placing the 40-ft. long vertical drains.

### Mobile rigs sink casing

Truck-mounted rigs moving along the trench were used to sink a 24-in. dia. casing by bailing out below while the casing was turned to encourage it to sink. A powered hoist on the truck handled a conventional bailing bucket. The hoist also was used to turn the casing by means of a bull-stick and a line through a snatch-block at a post on the bank.

After a casing was sunk to the required depth, perforated 9 in. O.D. drain pipe with its bottom-end plugged was set and centered in the 24-in. casing by use of steel "spiders" at each joint. Gravel was dropped into the hole in increments and tamped as the exterior casing was withdrawn.

These 40-ft. deep wells are spaced at 40 to 130 ft. centers as existing

*Fig. 6. Mobile drill rigs were used to put down 24 in. dia. casing for the drain and filter.*

*Fig. 7. Spiral steel wound perforated redwood stave pipe was joined into 40 ft. length and centered in 24 in. casing, then gravel was placed around the pipe as casing was withdrawn.*

pressures indicate may be necessary. Provision is made for an additional well between each of those now installed by placing a 36-in. dia. sheet metal ring in the bottom of the trench in a position so that porous concrete inside it can be knocked out.

Wells are blown-out with air or water, if necessary, to start the flow. Water from drains and that entering through the porous sides of the trench is conveyed to an outfall ditch and then to the river channel below.

Anderson Bros. of Houston, Texas, held a $430,000 contract for the correction work. The concrete was sublet to Shanahan Bros. of St. Louis; placing of the vertical drains was done by Harold L. Watson of St. Louis; and American Dewatering Corp. of New York kept the work area dry with wellpoints. Construction of the toe drainage system was under the direction of Col. R. G. Lovett, district engineer, Vicksburg District, Corps of Engineers.

## DEEP RELIEF WELLS AT FORT PECK

Fort Peck Dam, in northeastern Montana, has recently required addition of quite deep vertical relief wells to reduce seepage pressures through strata as much as 150 ft. below the downstream toe. This hydraulic fill structure has by far the largest volume of material ever put into a dam. It is 250 ft. high, contains 130,000,000 cu. yd. of material and was substantially completed in 1940.

Prior to construction of the impervious core of the dam, a cut-off wall of steel sheetpiles was constructed along the axis of the dam to prevent the flow of water through the considerable depth of material left in place over the shale foundation rock. This work required the driving of piling, to a depth of over 150 ft., a few sheets of which went to a maximum depth of 163 ft. (*ENR* Jan. 10, 1935, p. 35; Aug. 29, 1935, p. 291).

After considerable water had been stored behind the dam, seepage was noted at the downstream toe of a portion of the structure. At some points the seepage pressure in the underlying impervious material had a net head of 45 ft. above the ground level when the water level behind the dam was about 200 ft. above the lowest point of the toe. This condition indicated that some measures must be taken to relieve this pressure.

As a result, a few years ago, 21 temporary relief wells were constructed along the downstream toe for about one-half of the length of the main dam on that portion of the structure where the pressures were most severe. The wells were spaced about 125 ft. on centers, and they were made from 100 to as much as 150 ft. deep.

Although it was expected that the metal might be destroyed in a few years, to complete the project as soon as possible the wells were lined with perforated steel pipe varying in diameter from 6 to 10 in. and put down with well drilling equipment. Destruction of the pipe was faster than anticipated, and a more permanent system of 12 wells was installed in 1946.

In these operations a temporary 10-in. dia. steel casing was installed with a well drilling rig. Inside of this casing a perforated wood-stave pipe of 6-in. inside diameter and wrapped with wire was inserted, the perforations in the pipe consisting of slots cut in the timber at frequent intervals. After this pipe had been installed for the full length of the well the temporary steel casing was pulled by the drill rig. No gravel was added around the pipe here as was done in the similar work at Sardis Dam.

### Wells surged with air

To provide a porous packing around the wood pipe, compressed air was used to remove by "surging" the fines from the adjacent material. In this work air at high pressure was released intermittently at the bottom of 2-in. dia. pipe suspended in the well (Fig. 2). The results were very satisfactory.

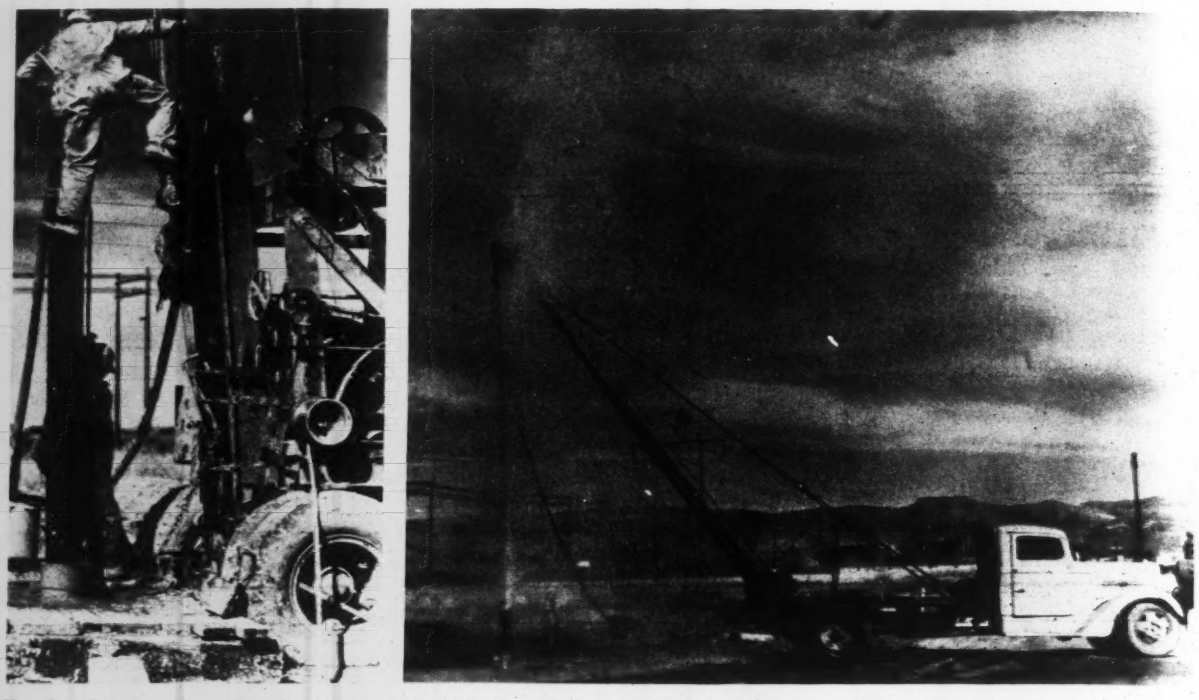


*Fig. 8. Construction of relief wells at Fort Peck called first for installation of a 10-in. dia. steel casing and then a 6-in. wood stove pipe as shown, after which the casing was removed. To produce a porous gravel pack around the wood pipe, compressed air was used, right, to remove the drill mud and fine material in the screen area.*

Flow from the various wells is collected in an open drainage ditch. The discharge fluctuates with the level of lake behind the dam. With the reservoir nearly full, or the water level about 200 ft. above the tops of the wells, the flow from all 17 wells totals 9.5 cfs. or about 0.5 cfs. per well. The maximum flow from any well since the wells were installed and the pressure stabilized has been approximately 1.5 cfs.

Indications are that the 17 wells will prove adequate and no additional wells will need to be constructed. It is expected that the wire wrapping around the wood pipe will be destroyed. However, the pressure of the surrounding earth will cause the pipe to retain its shape.

The work at Fort Peck was carried out by the Fort Peck District office of the Corps of Engineers. Col. E. H. Walter is the district engineer. Joel Norling of Billings, Mont., was the general contractor on the relief well installation.

## Research to Determine Toughness Of Welded Joints

Determining the toughness of welded joints in steel structures by measuring the load-carrying ability of specimen welds is proposed in a research report for sale by the Office of Technical Services, Department of Commerce. The report was prepared for the Watertown Arsenal Laboratory, Watertown, Mass., by Capt. S. A. Herres, now with Battelle Memorial Institute, Columbus, Ohio.

The proposal, according to the report, is that tests of specimens including welded joints should be compared with test results on similar specimens of unwelded metal. The tension side of the welded specimen should represent the irregular surface of the weld. In this way, the toughness or ability of the welded member to adjust its shape to withstand the load can be evaluated, just as the toughness of unwelded steel is measured by applying a load on a bar that contains a small notch.

The report gives the results of a series of bend tests on steel heat-treated to approximately equal strength but to different levels of toughness and with various kinds of notching. Tests were made at 70 degrees above and 40 degrees below zero Fahrenheit. The result show that deep notching and low testing temperature greatly decreased the load-carrying ability of brittle specimens.

The results reported cover preliminary tests in a program of evaluating mechanical effects in welded joints and structures. It suggests the load-carrying test as practical for welded joints, with rate of loading and testing temperature selected to represent the worst conditions expected in service.

Orders for the report, PB-49,032 "Mechanics of Welded Structures: Effects of Stress Concentrations and Residual Stresses on Mechanical Properties of Welded Joints", should be addressed to the Office of Technical Services, Department of Commerce, Washington 25, D. C. Either photostat or microfilm copies are available at a cost of $1 each.

# Water and Sewage Conference Notes

**Extracts from papers of significant interest that were presented at the meetings of the American Water Works and the Federation of Sewage Works Associations**

*Meeting concurrently for the first time, the American Water Works Association and the Federation of Sewage Works Associations provided the opportunity on July 21-25 for the presentation of some 60 papers on numerous phases of water supply and sewage disposal.*

*The meetings, which were held in the San Francisco Municipal Auditorium, for the most part were conducted as individual sessions on either water or sewage subjects. However, there were two sessions of mutual interest attended jointly by all delegates, which were devoted to groundwater pollution and reclamation of sewage effluents.*

*The following report consists of extracts from papers that were made available and which are believed to be of wide general interest. A news story on the conference, containing also a resume of other significant papers, as well as a listing of officers and awards, was published in the issue of July 31, vol. p. 147.*

## INDUSTRIAL WASTES AND REGULATIONS

SOME STATES require industry to submit detailed plans and specifications of industrial waste treatment plants, the general outline of which have been dictated by state board of health engineers. Some of the states require industry to reveal their manufacturing processes to learn the source of different types of wastes. A few states require the issuance of permits at the state level. These policies are opposed by industry in general and are fundamentally wrong. They should be abolished.

If an industry builds a plant exactly as required by the state department of health and the plant becomes a complete failure the industry rests its case saying that it built just what the state required and does nothing more. The state has no funds to correct such mistakes for which it may be responsible and consequently control discipline collapses.

On the other side of the picture a large number of states have taken an entirely different attitude. They set out objectives that the industry should meet. They fix the effluent standards that should be met and leave industry to meet these standards. Full responsibility for plant design and operation should rest with industry. Likewise, industry has the right to determine to what extent recoveries of by-products should be made.

In case of failures by industry in complying with commission requirements and after due investigation has been made, then orders based on specific requirements for the plant effluent in terms of plant production are in order. Such policies if administered fairly appear to be acceptable to industry in those states carrying on successful programs of stream pollution control.—*Ray F. Goudey, sanitary engineer, Los Angeles, Calif.*

In considering the problem of the effects of sewage and waste disposal practices on industrial operating costs, these conclusions are reached:

The value of pollution control in relation to costs of use of polluted water are entitled to far more attention than has been given to the matter in the past. The values obtaining to industrialists and ultimately reflected in the costs of production appear to rank with the importance of pollution control for the protection of public health, the maintenance of recreational opportunities and the prevention of nuisances.

In zones of concentration of population and industrial operations, municipal sewage and industrial waste disposal should be planned with recognition of the effect of treatment and disposal practices on the operating costs for the use of the waters into which the effluents are discharged.

In the past officials of certain groups disposing of wastes, notably municipal officials, have believed it was their duty to effect waste disposal at minimum cost to their respective agencies. Industry should undertake to make known that this is a limited point of view.

Industry as a whole is undertaking an organized effort to establish a general understanding of their economic interest in waste disposal programs. Where there is a conflict of viewpoints, the legislative bodies are being asked to take action to resolve any differences that now preclude the accomplishment of highest economic use of our water resources. —*William J. O'Connell Jr., consulting engineer, San Francisco, Calif.*

### Sewage Works At Portland

Work has started on the $14,500,000 Portland, Ore. sewage works project, which includes the construction of interceptors to pick up the flow from 61 outfalls and of a primary treatment plant for a 60-mgd. average flow. This program is designed to relieve pollution in the Willamette River caused by the discharge of wastes from cities and industries on the river. Dissolved oxygen in the river at Portland is about 42 percent, while the Columbia River, which the Willamette empties into just a few miles below Portland, has 100 percent dissolved oxygen.

Digested sludge from the new treat-

ment plant will be disposed of by mixing with the effluent and discharging into the Columbia River. A program of sampling and analysis will be set up to gather efficiency data.

A new diversion device is being tested which is designed to pass sanitary sewage flow into the interceptors and bypass grit.

As designed, this separating structure consists of a horizontal orifice placed alongside of and at the same elevation of the sewer invert. To reach the orifice, sewage backs up behind a dam in the main sewer channel and flows over a long curved lip which has its crest about one-twelfth of the diameter above the invert. Heavier grit will be prevented from entering the interceptor by the lip. As storm flow increases and overflows the dam, the grit previously accumulated behind the dam washes over and into the river.—*J. C. Stevens and H. Loren Thompson, Stevens and Koon, consulting engineers, Portland, Ore.*

### SAN FRANCISCO SEWAGE DISPOSAL

San Francisco will build a 65-mgd. primary treatment plant to supplement two existing activated sludge plants.

One of the main features of this work is the location of the sludge digesters at Islais Creek 6 mi. from the settling works at North Point. The digester installation will include a 1½-mgd. treatment plant to handle thickening and digestion tank supernatant liquor, spent elutriate and vacuum filter filtrate. This plant, consisting of four rectangular tanks, two for aeration and mixing and two for final sedimentation, will be converted into an elutriation unit for a larger plant to be built sometime in the future. Effluent will discharge into existing sanitary sewers.

Space limitations at North Point require the separation of the plant units. Two 10-in. pressure lines will connect North Point and Islais Creek. One of these lines will be used for sludge containing an estimated 2 percent of solids and the other for plant effluent to be used for elutriation water at Islais Creek. This latter line will be used for sludge when settling tanks are provided at Islais Creek some years hence. The capacity of these lines is considered adequate to handle the increase due to the use of home garbage disposal units, estimated as eventually amounting to 25 percent of normal sewage solids.—*C. C. Kennedy, consulting engineer, San Francisco.*

### FLUORINE IN WATER SUPPLIES

Application of fluorides to water for the possible control of dental caries has already attained such popularity in this country that many superintendents are having a difficult time restraining the consuming public from forcing him toward a practice which may not be wholly supported by existing epidemiological evidence. Most of the informed authorities, both medical and dental, insist that universal application of fluorides to waters deficient therein is not warranted upon the basis of present evidence. They consider that a reasonable number of experimental approaches on a full municipal scale are essential and that these must operate over a number of years to determine the values which may be inherent in such mass medication.

Hitherto chemical additions, with minor exceptions, have been predicated upon the correction or modification of the quality of the water with the primary intent of eliminating deleterious substances therefrom or of modifying their character in such a way as to make the commodity safer, more palatable or more physically attractive to the consumer. However, when we add a chemical to a water for the frank purpose of introducing a medical substance, with the intent to treat a consumer rather than to modify the water, we enter a different area of practice.

Some of the state departments of health in this country have already sanctioned the addition of fluorine to public water supplies. Without exception, however, each of these undertakings is in the nature of a mass experiment and demonstration. They are all under control observation and none of them have been studied long enough, according to medical and dental opinion, to indicate whether or not they will perform the task for which they have been initiated, without the possibility of attendant objectionable results.

Since this matter is of such widespread public interest and since many waterworks practitioners are literally being stampeded into the application of fluorides to water as a current procedure, it appeared to the writer that a brief set of guiding principles, resting upon present information might be useful to the waterworks profession. These principles, based on a review of existing practices and professionally informed judgments, are:

(1) Until the periods of controlled experimentation on water have fully elapsed and the findings on these procedures and their effect upon the exposed population have been authoritatively reviewed and assayed by competent medical, dental and public health professionals, the waterworks official should avoid the use of the public water supply for medication purposes.

(2) Even at that time, alternative practices for treating the diseases of the people other than through the community water supply should be thoroughly evaluated from the professional and the economic standpoints. In general such alternative practices, inherently more specific in their nature, are to be preferred.

(3) Universal application of chemicals to water for medication purposes should rest only upon substantial unanimity of opinion by official medical and public health agencies on efficacy of the treatment proposed.

(4) A natural prerequisite to any procedure for mass medication through the public water supply is complete concurrence between the officials of the water department and those of the health department. . . . *Abel Wolman, The Johns Hopkins University, Baltimore, Md.*

### WASTES FROM WATERWORKS PLANTS

A committee appointed to report on methods and practices of disposing of brine from zeolite softeners, washwater from filters and sludges from softening plants presented their conclusions in three separate preliminary reports.

*Brine Wastes*—Controlled dilution appears to offer the most generally applicable means of handling the water from zeolite softening plants but even this will be unsatisfactory unless ample dilution water is available at the time of brine release and unless releases are carefully controlled. Uncontrolled dilution will be satisfactory in relatively few instances (small cities located near large streams). Evaporation and brine disposal wells

will not generally offer a practicable solution to the problem. It is likely that in many cases difficulties associated with the disposal of brine waste will preclude the use of the zeolite methods as a means of softening municipal supplies.—*Paul D. Haney, associate professor of sanitary engineering, University of North Carolina, Chapel Hill, N. C.*

*Washwater From Filters*—So little has been done on the treatment of these wastes that there is a dearth of information available on factors for designing the structures required where treatment may be found necessary. There is need for more information on the sedimentation period required for proper clarification before discharge of settled water into the stream on the volume, weight, water content and chemical characteristics of the sludge so that proper sizes of treatment units can be determined, discharge periods correlated with stream flows and a design of plant prepared that will be economical and efficient.—*Harry R. Hall, chief engineer, Washington Suburban Sanitary Commission, Hyattsville, Md.*

*Softening Plant Sludge*—The only solution to this problem appears either to be to dewater and dry the sludge and dispose of it commercially if a market can be found, or to go one step further and calcine the dewatered or dried sludge, reclaim the lime for re-use in the softening process and sell the excess lime produced.

With present market conditions, excess lime could be sold readily. Studies indicate that under most conditions lime thus produced costs no more and possibly less than commercial lime, even when no credit is taken for the value of sludge disposal or for the value of the carbon dioxide gas produced.—*William W. Aultman, water purification engineer, Metropolitan Water District of Southern California, La Verne, Calif.*

## GROWTHS IN PIPELINES

Biological growths are a serious concern in reducing the flow in many long pipe lines or conduits. Their permanent elimination is not always possible or practicable, but their control may not be too difficult nor too costly.

For pipes or conduits of circular cross-section, mechanical cleaning by the use of special devices, such as balls and chains, may often be the most economical in time and labor where conditions permit. For long conduits of varying or irregular cross-section, however, chemical treatment may be the most practical and economical means. In such cases, where taste and odor problems are not involved, it may suffice to treat periodically only, merely to get by a period of high demand. In other cases where the organisms cause taste and odors, it may be necessary to prevent any growths whatsoever, by continuous treatment of the water.

If possible, a thorough study must be made of the organism causing the difficulty and the most effective chemical treatment used. Where the alkalinity of the water is high, copper sulfate may be relatively ineffective, or its action may not carry the required distance. However, in open ditches or conduits, chlorine may also become ineffective due to the effect of sunlight.

Other chemicals, such as the chlorinated hydrocarbons, should be used with caution in domestic water supplies, not only because of taste and odor problems, but also because of possible toxic effects. The use of such chemicals in a strictly irrigation supply should also be carefully checked as to their possible effect on plants.—*Ray L. Derby, principal sanitary engineer, Los Angeles Department of Water and Power.*

## WATERWORKS MANAGEMENT

Water utilities are business institutions and must operate on sound business principles in order to perform the function for which they are intended even though such utilities are monopolies. Some of these business principles that may be overlooked are the following:

In some municipally owned water utilities, excess earnings are turned over to the city treasury to support other activities. This is bad practice as water users thus pay a disproportionate share of unrelated municipal expenses.

Reading meters and billing consumers every two months instead of every month saves much routine work and is recommended for most communities.

Corporation yards should be designed for the job they perform and not just allowed to grow. Truck-level platforms and power-operated machinery for lifting and moving heavy loads will soon repay their cost in labor saving and will result in better employee relations.

All employees should be familiar with the general over-all operations and plant of the utility. A training course with suitable refresher periods is worthwhile.

Public relations cannot be overemphasized. "Silent service is not enough" is a good slogan that should always be kept in mind by the waterworks operator.—*G. E. Arnold, director, Water Department, San Diego, Calif.*

Publicly owned utilities, whether they be water systems, power systems, sewer systems or any one of numerous other classes of works, will find in revenue-bond financing many advantages which do not inhere in general-obligation financing.

This is particularly true if the legislation authorizing revenue-bond financing is carefully drawn. It can have greater flexibility and be better adapted to the needs of a utility system than is usually the case with general obligation financing. Furthermore, it tends to place publicly owned utilities on their own responsibility and to answer the charge sometimes made against some classes of utilities that they are leaning on tax credit. Also revenue bonds cannot be sold unless the utility can show to a practical certainty that it will be in receipt of sufficient revenues to service the bonds over and above paying operation and maintenance costs.—*S. B. Robinson, attorney-at-law, Los Angeles.*

## GROUNDWATER LEGISLATION

In the preparation of legislation for the conservation and control of groundwater the following should be included:

*First*, a preamble setting forth the need for the adoption of the rule of appropriation for beneficial use as the guiding principle, and justifying the exercise of the police powers of the State in enforcing the Act.

*Second*, five basic concepts, as follows:

1. All groundwaters of the state are public waters and available for appro-

priation for beneficial use subject to existing rights.

2. Beneficial use shall be the basis, the measure and the limit to the use of waters included in the Act.

3. Administration shall be by a state authority whose police powers are clearly and specifically set forth and whose determinations both as to water rights, used and unused, existing at the time of the passage of the act, and water rights acquired following its passage would be subject to review by the courts.

4. A definition of vested rights; provision for filing declarations covering such rights; recognition of vested rights existing at the date of passage of the act; and forfeiture of all rights by non-users after a reasonable and stated period of time.

5. Specific exemption of domestic water supplies from the provisions of the act, except as to furnishing information required by the state authority.—*A. P. Black, professor of chemistry, University of Florida, Gainesville, Fla.*

It is the duty of the American Water Works Association to sponsor accelerated studies of the groundwater systems of our country in order that their safe yields may be intelligently developed and conserved by proper use and protection.

The degree to which appreciation of the value of the seen exceeds appreciation of value of the unseen is clearly demonstrated in the 1948 Interior Department Appropriation Bill. The Bureau of Reclamation engaged principally in the regulation and use of surface waters in the seventeen arid states has a total appropriation of $37,013,000. Under the item entitled "gaging streams" in the Geological Survey there is a total appropriation for activities throughout the entire country of only $2,625,000. This includes funds available for groundwater studies.

The Senate committee on appropriations recommended that the House prohibition against use of funds for cooperative or non-cooperative groundwater activities be stricken from the bill and that not less than $740,000 be used for such activities. What a pitifully inadequate sum! It is clearly insufficient to continue the cooperative studies already initiated and will discourage expansion of studies essential to conservation and intelligent development of one of our most valued natural resources. . . . *Malcolm Pirnie, consulting engineer, New York City.*

### Macroscopic pollution

Most emphasis in checking on pollution of water supply systems centers around the detection of coliform bacteria or other microscopic organisms. However, possible pollution from macroscopic and visible organisms is too often overlooked.

Elevated storage tanks and surface reservoirs are sometimes not adequately protected from birds, insects and plant life. Adequate screening is required.

Snails, frequently seen on meter screens in one village, were discovered to have access through inadequately protected manholes on air-lift discharges. Copper sulfate was found to be toxic to these snails.

Bugs were found in water in certain parts of a large town by consumers having old-type meters without screens. The source was found to be a cross-connection which permitted entry into the city system during hydrant flushing activities when pressure was low. These bugs were not able to pass through the meters having screens.

Midge flies or gnats, the larvae of which appear in the water supply in the form of blood worms, require a 24-mesh screen to prevent their entrance to reservoirs, etc. Chlorine will not kill the larvae but they are susceptible doses of DDT in concentrations as low as 0.01 ppm. Such doses do not harm the water, but it is probably well to make provision to pump the water to waste rather than into the distribution system.—*J. C. Weart, chemist, and J. C. Klassen, chief sanitary engineer, State Department of Public Health, Springfield, Ill.*

### Power vs. hand labor

General labor unrest, unionization, advancing wages and a decreasing supply of common labor present new problems in the solution of which there are opportunities for upgrading to the advantage of the waterworks construction industry.

Progressive management is doing much to compensate for changes in the work force by the use of better equipment, but even with the best management, much improvement in methods is needed. For large pipe lines, power ditch diggers and power hoists are standard practice. Common labor either ceases to be common labor or is stepped up in production through mechanical power that it produces enough additional output to compensate for the high wages.

Moreover, many systems are using to good advantage such labor-saving devices as compressed air machinery for drilling under paving and through obstructions, for cutting in valves, breaking pavements and operating main line valves.

There is still too much hand labor involved in the digging of the necessary holes in the street and at the curb line. Someone will develop a service car so equipped and powered that one or two men will do all the work of cutting, digging boring, cutting in valves and backfilling—all with power machinery. This is an opportunity for a top flight engineer in the waterworks manufacturing field.—*John H. Murdoch, Jr., counsel and vice-president, Water Works Service Co., Inc., New York City.*

### Municipal water softening

More than 750 communties in this country now have centrally operated water softening plants and this number will increase, especially when the general public becomes better acquainted with the benefits acruing from this service.

Four principal advantages claimed for municipally-operated softening plants as opposed to no softening or individually operated home or industrial units follow: (1) Many industries depend on soft water and are attracted to towns with such a supply. (2) Water can be maintained at a uniform level of hardness. (3) A strict sanitary control can be maintained so the product will conform to public health standards. (4) Where softening is economically justified, it is cheaper to do it on a large-scale basis.

Softened water is a matter of economics depending on local conditions, but if it is justified, the entire community is entitled to it.—*D. L. Maffitt, general manager, Water Works, Des Moines, Ia.*

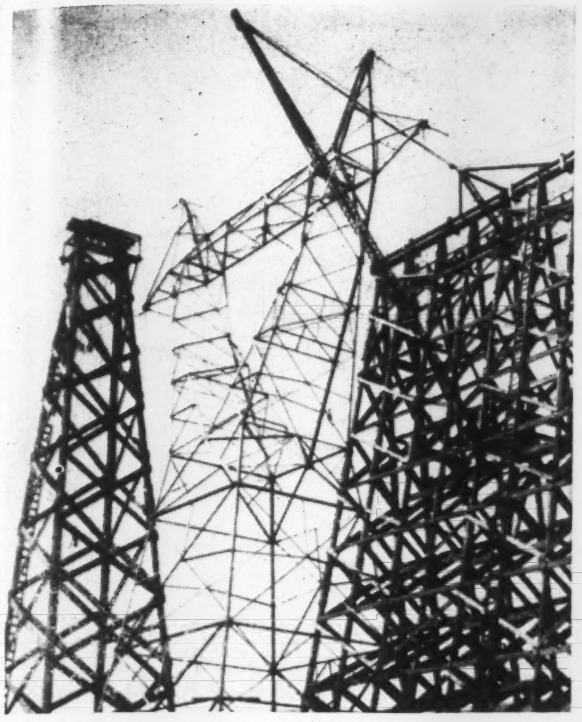


*Fig. 1. Single circuit transmission tower set up in the testing device ready for the load to be applied.*

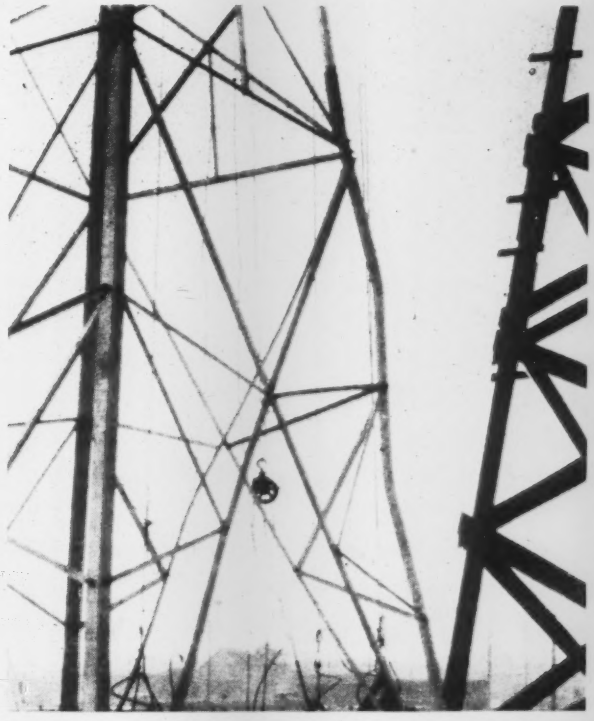


*Fig. 2. A transmission tower failure in compression is evidenced by buckling of one of the members.*

# Testing Transmission Towers to Failure

**Frank Mendel**
Contract Manager, Tower Department,
Bethlehem Pacific Coast Steel Corp.

***Contents in Brief**—Transmission towers are subjected to full size structural tests by a West Coast steel company and the tests frequently result in failure of the tower. Tests are made to aid designers in producing economical designs, which is significant when as many as 1,000 similar towers are involved. Recently tested was a group of towers to be used to carry transmission lines in California's Central Valley project.*

In transmission tower design, reduction of weight is considered of prime importance in producing the most economical design. In many cases 90 percent of the towers on a line are of identical design, consequently a 100- or 200-lb. weight reduction may result in a large saving when, say, 300 to 1,000 towers are involved. Accordingly, as an aid to the designer, full size towers are subjected to structural tests, which frequently result in failure of the tower. Important among recent tests were a series conducted on towers for use in California's Central Valley project.

Equipment installed at the South San Francisco plant of the Bethlehem Pacific Coast Steel Corp. and used for these tests includes a system of concrete foundations with projecting steel angles to provide rigid bases for towers of varying widths. Vertical loads are applied by suspending dead weights of steel billets or zinc slabs. Non-vertical loads are applied by use of chain blocks which transmit their loads to the tower under test through pulleys supported by two timber t frames, each 100 ft. high. Gages the elliptical spring dynamometer t are used for measuring the load plied.

Deflection readings are usu taken with the use of a transit set u some distance from the tower. The instrumentman sights on a scale graduated to tenths of an inch which is fastened to the tower at level of the top conductor.

### Loadings simulate various conditions

Loads are applied to simulate the weight of the conductors, the transverse pull due to wind load on the conductors, and the pull applied to the tower from the tension in the conductor when three wires are broken in the same span adjacent to the tower. Towers are usually tested to 50 per-

cent over the required design loads and are required to withstand this overload. If such a test is passed successfully, additional loads are frequently applied until failure occurs in some member of the tower.

As the vertical loads are awkward to apply, the 50 percent overload is installed at the beginning of the testing program. All other loads are then brought up to 50 percent of design value. Deflection readings are taken and the tower is carefully observed for signs of distress or undue bowing. The loads are then increased in steps to 75 percent of design load, full design load, 25 percent overload, and 50 percent overload with similar observations made after each increment.

Finally the loads are released and the deflection again measured to determine permanent set which may be due to bolt slippage. If a failure occurs prior to reaching the 50 percent overload, the damaged members are replaced with pieces of larger size and the test repeated.

#### Undamaged test towers reused

After all tests are successfully completed, the tower is dismantled and all members examined for any signs of overstress in either compression or tension. Members overstressed in compression can be easily detected as they buckle as a whole or are crippled at the end connections. A member is considered as having failed in tension if any part of it shows sign of having passed its elastic limit as indicated by a permanent elongation. This condition is evidenced by a noticeable localized reduction in cross-sectional area and a peeling of the zinc coating if the member is galvanized. All bolts are carefully inspected for signs of failure in shear.

Undamaged members of the test tower are later shipped to the field for building into one of the towers of the transmission line. In this manner not only is the tower design tested, but the shop detail drawings from which subsequent towers are to be made are also checked.

Moreover, the ease or difficulty encountered in building the test tower serves as a valuable guide in predicting whether or not the tower can be erected in the field with a minimum of time and effort and is helpful in working out a construction program.

# Welded Girder Sustains High Stresses In Test at Zero Degrees F.

**La Motte Grover**
Chairman, Structural Steel Committee
Welding Research Council

THE FOURTH of a series of six, 9-ton, welded steel box girders, which was subjected to a static load test at 0 deg. F. recently at the National Bureau of Standards, deflected nearly 9 in. on a 22-ft. span before it fractured. The modulus of rupture was computed to be 80,000 psi.

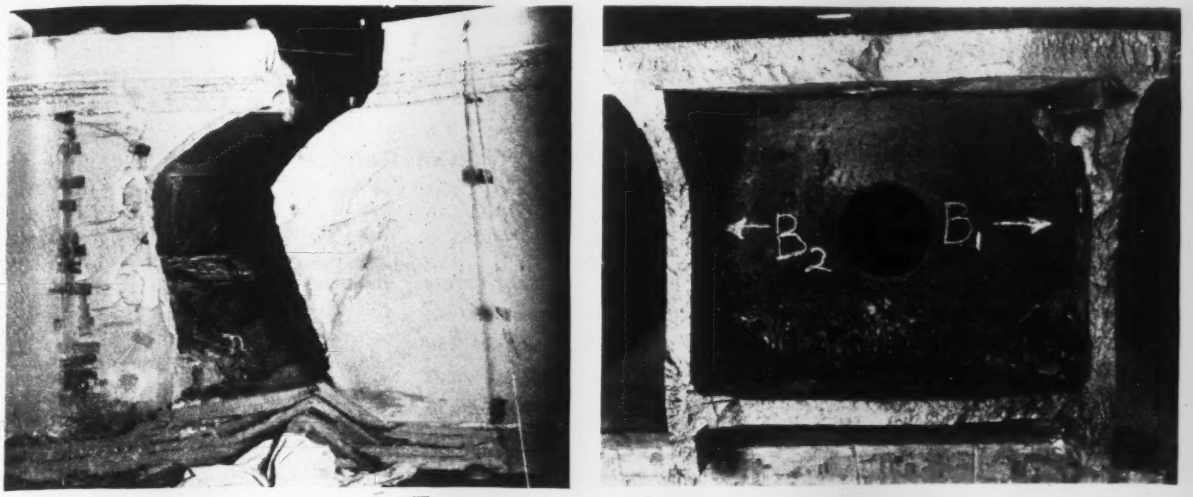
Part of a program being carried out for the Structural Steel Committee of the Welding Research Council of the Engineering Foundation to determine the effect upon the capacity of a welded structural member of severe geometrical constraint against ductile behavior, this series of tests is being made to determine effects of various temperatures on load capacities. Previous tests in this series were described in *ENR* Oct. 17, 1946, vol. p. 502.

Constructed by the Ingalls Shipyard at Pascagoula, Miss., these girders of 22-ft. span, 2½-ft. width, 2-ft. 1½-in. depth and 9-ton weight are characterized by severe rigidity of design details and by the imposing of especially difficult welding sequences and construction procedures, as compared with usually prevailing commercial practices. Despite these unfavorable conditions, coupled with the reduction of toughness that results from such a low temperature of testing as 0 deg. F., this fourth girder (constructed of the same fully-killed steel as that of the second and third specimens) fractured at a computed extreme fiber stress (modulus of rupture) of 80,000 psi.

This modulus is 25 percent greater than the ultimate tensile strength of 64,000 psi., which was determined by conventional tensile test of the material at room temperature. The ultimate tensile strength was 70,000 psi.

*National Bureau of Standard Photos*

***Welded girder on 22-ft. span immediately after failure in test at 0 deg. F. The crack in the side plate about 3 ft. from the near end of the girder is believed due to the violence of the failure.***




*The midspan fracture, which was not through a weld, had a bright crystalline appearance.*

for coupons of the material tested at 0 deg. F. The third girder, which was tested at room temperature, did not fracture, but deflected 18 in. under a maximum load of 1,685 kips, a 14 percent greater load than that sustained by the fourth specimen.

The fractured surfaces at the midspan break in the last test were of the so-called cleavage type, of bright crystalline appearance, with no obvious defects. A rather striking feature of the failure was the occurrence of a secondary fracture quite near to one of the supports, slanting diagonally upward toward midspan. This fracture evidently resulted from the sudden release of a tremendous amount of energy when the girder parted completely at midspan under a load of 1,476 kips, following a pronounced starting of the midspan crack at about 1,400 kips.

Girders of this program are being tested at various temperatures ranging from room temperature down to minus 40 deg. F., to determine the manner in which the maximum sustained load and absorption of energy decrease for a large steel member as the temperature of testing is lowered and when steel material of poorer notch-toughness is used. The next girder, of identical design and construction, is to be tested at plus 40 deg. F.

# German Lightweight Concrete Described in Report

Novel developments in lightweight concrete are described in a report on German building materials by the British Intelligence Objectives Subcommittee. Lightweight foamed concrete made by the hydrogen-peroxide process is considered one of the most interesting. This process was patented by Deutsche Goldund-Silberscheid Anstalt, which also sponsored research on foamed plaster and nailable foamed concrete made with paper pulp.

The hydrogen-peroxide process is said to be simpler and easier to control than the aluminum-powder process for making foamed concrete. The bubbles formed by liberated gases are more uniform in size and the process can be used with any type of cement and under ordinary temperature conditions, the investigators report. The cost of the process is slightly higher than the aluminum powder process.

Other German foamed concretes were made with Iporit, an I. G. Farbenindustrie product employing a sulphonic acid wetting agent, and with the Asmus process, which produced a foam with 10 percent aluminium powder and 90 percent calcium carbide.

### Prestressed, composite slabs

Another outstanding building material found in Germany is the Schaefer slab, a precision-made composite concrete said to be quite different from any material used in the United States or Britain. The slabs are lightweight hollow-core pumice concrete covered with a dense concrete coat. Twisted pretensioned wires are embedded in the coating for reinforcement.

The slabs are made in 12 and 20 in. widths and in varying thicknesses by an ingenious machine that produces lengths up to 590 ft. Pieces of the desired length are sawed from the completed slab.

The Schaefer slab is used for floors, roofs and walls. Buildings made from this material with simple mortared joints are found to provide good insulation and resistance to dampness.

Developments in slag cement and lightweight concrete manufacture, including the Schaefer slab, are described in "Slag Cement and Lightweight Concretes" (PB-67458; photostat, $4; microfilm, $2; 59 pp.).

Also, a report is available, by American and British investigators, on German prefabrication systems and materials, entitled "Technical Developments in Prefabricated Housing" (PB-60897; photostat, $5; microfilm, $2; 62 pp.)

Orders for these reports should be addressed to the Office of Technical Services, Department of Commerce, Washington 25, D. C., and should be accompanied by check or money order, payable to the Treasurer of the United States.

# Payment Bonds on Government Work

**Frank V. Bonzagni,**
Massachusetts Bar

**John Reich,**
New York Bar

***Contents in Brief**—Those who supply labor or materials to contractors or subcontractors on U. S. Government public works are protected, so far as remuneration is concerned, by a payment bond required by the Miller Act. Rights under the bond cover only materials and services furnished to a prime contractor or subcontractor and do not extend to those supplying materials through middlemen. Suggestions are made for collecting under the payment bond.*

IT IS IMPORTANT for those who furnish labor or materials to U. S. Government contractors or subcontractors engaged in work on public projects to understand some of the whys and wherefores of the payment bond required by the Miller Act since this payment bond frequently proves to be the only means of obtaining payment for the labor or materials furnished.

The widespread lack of understanding of the most fundamental aspects of the payment bond is evidenced by the nature and quantity of the requests made to government contracting officers when contractors or subcontractors fail to meet their obligations. These requests are invariably disposed of by a stereotyped reply inclosing a printed form which explains, generally, that federal buildings are not subject to mechanics' liens, cites the provisions of the Miller Act and related informative matter, and concludes with the statement that the contracting agency cannot undertake to give advice as to the best method of securing or collecting claims. Often, the matter is acute, and time is pressing—sometimes running dangerously out—when the supplier of labor or materials thus, belatedly, affords himself the opportunity of striking up a nodding acquaintance with what should have been an old friend.

The Miller Act states that before "*any contract, exceeding $2,000* in amount, for the construction, alteration, or repair of any public building or *public work* of the United States is awarded to any person, such person shall furnish to the United States —(1) A performance bond—for the protection of the United States" and "(2) *A payment bond*—for the protection of *all persons supplying labor and material in the prosecution of the work* provided for in said contract. . . ." (Italics have been added for the purpose of the discussion which follows).

The words "any contract, exceeding $2,000 in amount" only establish the general rule. There are exceptions. Those who contemplate furnishing labor or materials to a federal government contractor or subcontractor may be cautioned that it is wise to check specifically on two points: (1) whether the contractor actually submitted the statutory payment bond, and (2) whether the contract, covered by his bond, is within the purview of the Miller Act.

The phrase "public work" has received considerable legal handling. However, suppliers of labor and materials can usually rely on the proposition that an enterprise is "public" when title thereto passes to the government as fast as the work is paid for. And the matter of whether or not the government has such title can, in most cases, be readily resolved by a reading of the prime contract. If title to the work does not pass to the government prior to its completion, the work is not "public".

The "payment bond", itself is a bond executed by a surety or sureties satisfactory to the government representative awarding the contract. It is usually a bond executed by an approved surety company. The amount of the bond is prescribed by the act and depends on the amount of the government contract. If the total amount payable by the terms of the contract is not over $1,000,000, the bond is required to be in the sum of one-half the total amount payable under the contract; if the total amount payable by the terms of the contract is over $1,000,000 but not more than $5,000,000, the payment bond is required to be in the sum of 40 percent of the total amount payable under the contract; and if the total amount payable under the contract is over $5,000,000, the payment bond is required to be in the sum of $2,500,000. A government standard form bond is used to insure uniformity and sufficiency. The surety, of course, can be held liable only up to the amount shown on its bond; when this amount is exhausted by payments to those protected by the bond, the surety is discharged from further liability.

### Extends to subcontractor only

Not every supplier of labor or materials whose efforts or products are used in the prosecution of the work may recover under the bond even though, as previously stated, the Miller Act provides that the bond is "for the protection of all persons supplying labor and material in the prosecution of the work." This was made clear in a leading Supreme Court decision rendered in 1944 (322 U.S. 102): A contractor had furnished a payment bond in connection with his undertaking to construct certain dwelling units for the government. He placed an order for some necessary building materials with materialman A. Materialman A filled the order after purchasing the materials from materialman B. A was paid in full by the prime contractor but A failed to pay B in full. B, thereupon, brought suit on the bond.

After wrestling with the word "subcontractor" (as used in the Miller Act) and with the distinction between

a subcontractor and a materialman, the court decreed that B could not recover. It held, in effect, that in order for a person who has supplied labor or materials in the prosecution of the work to recover on a payment bond furnished under the Miller Act, it must be shown that such person acted in pursuance of direct contractual relationship with the prime contractor or direct contractual relationship with one of the subcontractors—a subcontractor being defined by the court, for purposes of the Miller Act, as "one who performs for and takes from the prime contractor a specific part of the labor or material requirements of the original contract, thus excluding ordinary laborers and materialsmen." Accordingly, only those laborers, mechanics, materialmen and subcontractors who deal directly with the prime contractor or with a subcontractor under the prime contract may bring suit on the payment bond.

Before leaving the subject of who may, and who may not, recover on the payment bond, it is important to note some of the judicial decisions that have bearing on the meaning of the phrase "supplying labor and material in the prosecution of the work", since only persons so contributing to a government enterprise may recover on the bond. The words "labor" and "material" have been very liberally construed: "material" may include among other things, equipment accessories, goods and provisions. But the courts have held that a distinction must be made between labor and materials particularly required for the work and such labor and materials as are only incidental to the government project.

### Some materials not covered

The courts have held, further, that, as a general rule, a distinction must also be made between materials extended on or consumed in the work and materials which may be available for other jobs as well. Thus, one who supplies equipment or tools to a government contractor or subcontractor, by sale thereof, is not protected by the payment bond if the equipment is such that it will probably outlast the job.

For equipment supplied under a rental arrangement, the rental is protected by the bond (83 F. (2d) 388). In one case, the rental of a lighter, a dredge, a boathouse and other equipment used for the specific purpose of performing dredging work undertaken by a government contractor was held to be within the orbit of the payment bond (57 F. (2d) 864). Similarly, the rental of cars, track and related equipment (244 U.S. 376) and the rental of scows for the transportation of necessary materials to the place of work (277 F. 945) have been held to be protected by the payment bond.

The theory under which rental of equipment is held to be covered by the bond, while sale of the same equipment is not, is that under a rental arrangement the equipment is solely earmarked for the project and the contractor's or subcontractor's leased interest in the equipment is wholly consumed on the job.

Appliances, accessories and repair parts which add materially to the value of the contractor's or subcontractor's equipment are ordinarily not covered by the Miller Act, although appliances, accessories, and even equipment, necessary to and wholly consumed in the work are covered (110 F. (2d) 115). Also protected by the payment bond are such repairs, of comparatively inexpensive character, as are necessitated by ordinary wear and tear; repairs are not covered by the bond if they add materially to the value of the equipment used in the work.

### Proof required for items consumed

Groceries and similar supplies may or may not be covered depending on whether or not they are indispensable to the work, form an integral part of it, or are necessarily involved in it (52 F. (2d) 235; 246 U.S. 257). Freight charges for transportation of necessary materials have been held to be covered (202 U.S. 442; but see 20 F. Supp. 879). The supply of such materials as coal, oil and gasoline is protected by the bond but a claimant is often defeated in his efforts to collect for such materials by his inability to prove that they were used in the work. Any item which is neither in the "labor" nor the "material" category, such as an insurance premium or money loaned to a government contractor, for whatever purpose, is clearly not covered.

To summarize, if (1) a person in direct contractual relationship with a government contractor or one of his subcontractors (2) supplies labor or materials, or both, in the prosecution of the work undertaken by such government contractor, (3) the latter having furnished a payment bond in

### FACTORS AFFECTING PAYMENT UNDER THE MILLER ACT

1. Aside from payment bond coverage, check the credit of a contractor or subcontractor before making a substantial commitment to supply labor or materials; do not assume that a government contractor is necessarily in good financial condition.
2. Determine whether the prime contractor furnished a payment bond in connection with his government contract and whether the contract is of the type covered by the Miller Act.
3. Ascertain whether your goods or services are such as are covered by the act.
4. Remember that if your dealings are not with the prime contractor or one of his subcontractors (as distinguished from a worker or materialman) you will not be covered by the bond.
5. Make sure that your materials are, in fact, going into the job and are not being used for other purposes; a close check is particularly important with respect to such materials as coal, oil and gasoline—ordinarily hard to trace.
6. Although not required to do so, notify the surety of your claim; you may stay out of court that way since the surety will usually satisfy a properly substantial claim covered by the bond.
7. Don't delay your efforts to recover on your claim; for many reasons time will not work in your favor.
8. If your dealings were with a subcontractor, give the prime contractor written notice, by registered mail, of the name of the subcontractor and the amount claimed, within 90 days from the date on which you supplied the last of the labor or materials on which your claim is based.

connection with this work (4) which is being performed under a contract exceeding $2,000 in amount (5) for the construction, alteration or repair of any public building or public work of the United States—the labor or materials, or both, so furnished, are covered by the payment bond, and the supplier thereof may recover the amount, or unpaid balance, due him in connection therewith. But, of equal importance, is a consideration of some of the factors involved in effecting this recovery.

### How to collect

Time and notice are two important factors that have often nullified the efforts of a rightful claimant to collect on the payment bond. The Miller Act provides that a supplier of labor or materials, covered by the act, "who has not been paid in full therefor before the expiration of a period of 90 days after the day on which the last of the labor was done or performed by him or material was furnished or supplied by him for which such claim is made, shall have the right to sue on such payment bond for the amount, or the balance thereof, unpaid at the time of institution of such suit. . . ." The act further provides that no such suit shall be commenced later than one year after the date of final settlement of such contract.

Recognizing the fact that a supplier of labor or materials has no idea, ordinarily, as to when "final settlement" is actually made by a government agency—especially since "final settlement" does not mean final payment (240 U. S. 214)—the Miller Act directs the Comptroller General to furnish a certified statement of the date of such settlement, if it was made, to any person who submits an affidavit that he supplied labor or materials to a government project and was not paid therefor. The act further provides that this certified statement is conclusive, as to such date, upon the parties. It is also important to note that a certified copy of the payment bond itself and the contract for which it was given may also be obtained from the Comptroller General upon submission of such affidavit.

With respect to notice prior to the commencement of suit on the payment bond, the Miller Act requires no notice of any sort if the claim is founded on labor or material supplied as a result of direct contractual relationship with the prime contractor.

Furthermore, if the labor or material was furnished in consequence of direct contractual relationship with a subcontractor, the act provides that the claimant shall have a right of action upon the said payment bond upon (1) giving written notice to the prime contractor (2) by registered mail, in an envelope addressed to the contractor at any office maintained by him or at his residence, (3) within 90 days from the date on which the claimant performed the last of the labor or supplied the last of the material for which he was not paid, (4) stating with substantial accuracy the amount claimed and the name of the party to whom the labor or material was furnished. Although a notice which does not fully satisfy these four elements may work in a particular case, it would be foolhardy for a claimant to jeopardize his cause by failure to lay this proper foundation.

# Report on China's Sanitation Progress

***Editor's Note**—Encouraging progress is being made in China toward construction of sanitation facilities, despite obstacles of high cost and lack of equipment. This is the opinion of Col. A. B. Morrill, who was interviewed by Engineering News-Record on his arrival in this country after six years abroad. Colonel Morrill points out that water and sanitation facilities at our Army bases have stimulated popular demand for similar installations. He also tells of an economic study in which a sewer system was justified on the basis of savings in coffins, due to the decrease in death rate.*

WATER SUPPLY PROJECTS for a number of large cities in China that at present lack any type of unified municipal supply are being prepared rapidly, according to Col. Arthur B. Morrill, sanitary engineer officer of the U. S. Public Health Service, who returned to Washington in May after serving since 1941 in China, India and other countries.

One project is nearly complete for a distribution system for the city of Lanchow in Kansu Province. This municipality has a total population of 175,000 people and the proposed utility would serve 125,000. A few months ago money for financing the work was available in Chinese currency but since the rate of exchange has changed so greatly, the cost of the project will be about double. Additional financing will be required before the construction can be started.

Detailed plans have also been prepared for a distribution system for Sining in Chinghai or Kokonor province. This city of 60,000 is in a remote area in northwestern China and is 500 miles from any public water supply system. Chinese currency is available to finance the project and as soon as the Chinese national government permits the city to purchase foreign money, start of work will be possible.

A collecting gallery penetrating the alluvial material of the Yellow River Valley is planned as the source of water for Sining. This project is expected to overcome major difficulties due to high turbidity and floating ice in the Yellow River, and at the same time provide water that will need no filtration. A distributing reservoir will be constructed with the distribution system. Design of the latter is interesting in that it will be built atop the high thick wall constructed several hundred years ago to protect the city.

### Big city to get supply

A waterworks and a sewer system for what is believed to be the biggest city in the world without a municipal waterworks—the city of Changsha

in Hunan Province are being designed. Changsha has a population of 420,000, and it was severely damaged by bombing during the war. Now with the help of the Chinese national government plans for these utilities are beginning to take shape. Financing difficulties may delay the start of construction.

At Nanking, which has over a million people, much additional distribution piping is under consideration. Another project proposes to return to Shanghai a large capacity high-lift and a large-capacity low-lift pump that were transferred to Nanking by the Japanese. Because the pumps are not suitable in their present location, and because the Chapei Water Co., which owns the pumps, is demanding their return to Shanghai, early replacement with more suitable units has been arranged.

Nanking recently also started a program calling for completion of a sewage system of which a small part was built before the war. J. C. Chang, who obtained a master's degree in sanitary engineering from Harvard University about five years ago, will head the sewerage work at Nanking. Mr. Chang until recently was chief engineer on construction of the sewer system at Chungking.

### Chungking builds sewer system

At the latter city, work is nearly finished on a sewer system to provide facilities for about one-third of the population of this city. Work is rapidly going ahead on studies for completing a system to provide for the entire population of Chungking. Because of the high price of cement, the larger sewers for Chungking have been built of stone masonry. In some cases about the lower half of the sewer is made by cutting carefully into solid rock. The upper half is built of masonry. However, for smaller size sewers, the first precast concrete pipe to be produced in Chungking was used. This unreinforced pipe, was manufactured with crews specially-trained by Chungking engineers under general supervision by Col. Morrill. It was designed to meet specifications of the American Society for Testing Materials.

In making a study of the economic justification for the sewer system for Chungking, it was calculated that, if a good system was built, the saving in

Photo by A. B. Morrill

***These precast concrete pipes, the first produced in Chungking, China, are manufactured to meet ASTM specifications. Varying in diameter from 12 to 20 in., the pipes are flattened on one side to provide better bearing.***

coffins, due to the reduced death rate, would pay for the improvement in about 19 years. In reaching this conclusion, various factors were listed as major causes of the high yearly death rate, which is 30 per 1,000. The lack of sewers cause about one-fifth of these deaths.

The number of Chinese cities with water systems at present is small, according to Col. Morrill. His work in China shows that only 24 of the largest Chinese cities enjoy the convenience and protection of "piped" water systems. Treatment in most of the serviced cities is sedimentation and filtration, with some having chlorination.

At present no American contractors are known to be employed on water supply and sewer work in China. The outlook for obtaining contracts for this construction is not favorable. However, Chinese municipalities are arranging the purchase of considerable American-made pipe and equipment. Also, demand for civil and sanitary engineers has increased rapidly during the past decade. There is especially a serious need for sanitary engineers with broad experience in overall planning of municipal work. To meet some of this need, American consultants may be engaged.

Col. Morrill also points out that, although sanitary construction has been almost at a stand-still since 1937 in China, due to the war, the great need for this type of construction has been forcefully demonstrated to Chinese officials and to the public. This condition has been brought about by transfer of the residents of municipalities with good water supply facilities to areas of backward sanitation, and in turn, by the employment of residents of the backward areas in the more modern sections of the country. Moreover, Chinese officials and engineers visiting American military camps in China found that these areas were equipped with better water supply and sewage disposal systems than the largest nearby Chinese City.

It is further pointed out that, despite the large population of China, wages in the larger cities have become so high that it is much more costly to obtain water by crude methods using only manual labor than by modern practices using mechanical equipment. The net effect of these conditions has been the development in China of a big demand for improved sanitation.

A report on Col. Morrill's interesting experience in selling city officials of Sining on the plan to construct a municipal water works appeared in *Engineering News-Record*, March 6, 1947, Vol. p. 390. Col. Morrill is now returning to Detroit, where he was engineer of sewage treatment before the war. However, the World Health Organization of the United Nations and the Ministry of Health of China are making requests through the U. S. Public Health Service for his return to China. He first worked in China 36 years ago.

## Use of Clay in Concrete Is Being Studied

Experiments now being conducted by the U. S. Bureau of Mines indicate that the common white Florida clay, discarded as waste at phosphate pits, may be converted into a light aggregate suitable for mixing with cement in building blocks and slabs.

W. D. Outman, of the State Agricultural Department, said that experiments further indicate that the "Bartow clay" may be developed into a rock fill for road building aggregate.

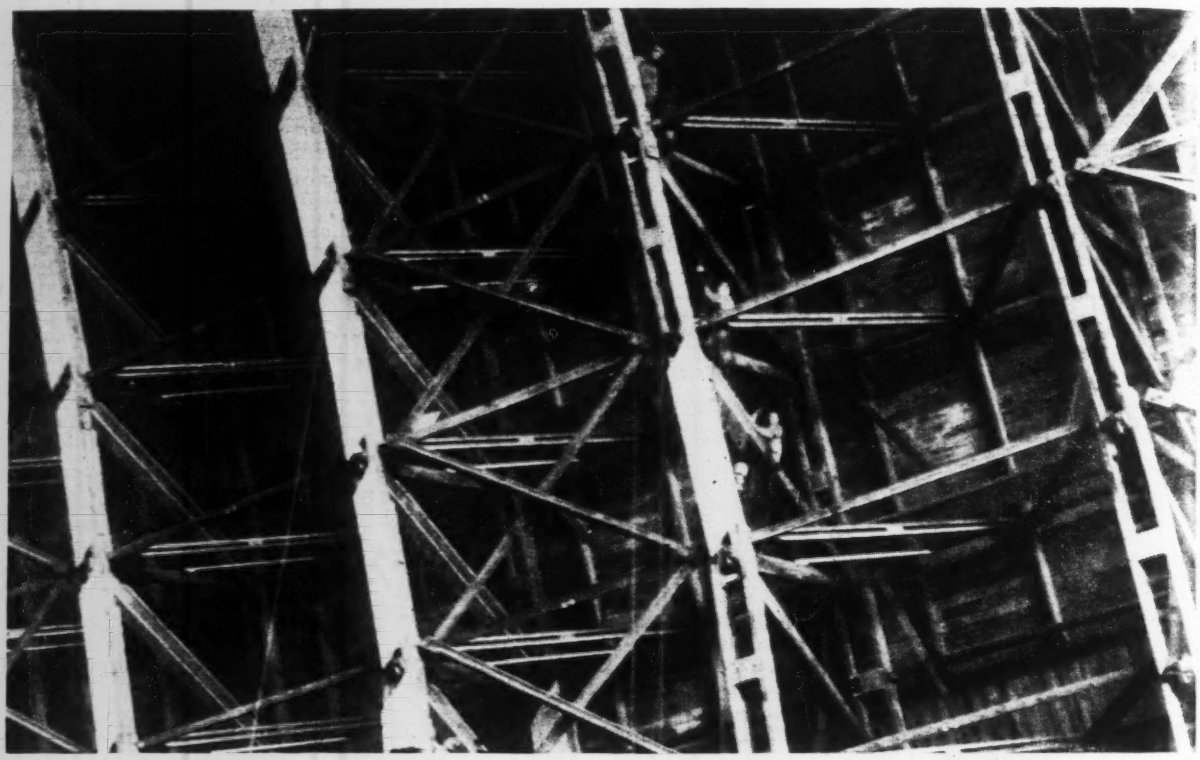


*Fig. 1. Hoist lines are employed to deliver materials to workmen high above the hangar floor. The men shown are nailing diagonal cross pieces on both the top and bottom of the lower chord of the trusses.*

# Small Crews Use Simple Scaffolding For Repair of Big Hangars

**E. S. Pashley, Sr.**
Supervising Engineer on Hangar Repair
Byrne Organization, Washington, D. C.

***Contents in Brief**—The Navy's huge timber airship hangars on the East Coast are being repaired by riggers using simple scaffolding consisting of light-weight staging placed on the lower members of the trusses and pull boards suspended from the purlins. By means of this type of scaffolding, a 30-man crew can complete the work at one hangar in ten weeks.*

METHODS now being used to repair the Navy's timber hangars on the East Coast are in sharp contrast to those in use on the Pacific Coast. At the latter location the R. N. Pomeroy firm is repairing four of the 300x1,050-ft. airship docks, using a 145-ft. high traveling timber scaffolding on which 50 men work (*ENR* Feb. 6, 1947, vol. p. 205). On the Eastern Seaboard, the Byrne Organization is repairing similar hangars with scaffolding so limited that the amount needed for a 30-man crew can be loaded into a single semi-trailer for transportation to the next location.

The framework of the hangars consists of elliptical trussed arches supported on concrete bents 24 ft. high. The arches have a clear span of 235 ft. and the intrados of the lower chord is 160 ft. above the hangar floor at the crown, where the depth of the trusses is about 14 ft. Because of the critical supply condition when the hangars were constructed, green lumber had to be used extensively. Shrinkage of the timber was inevitable and the Navy was soon faced with the job of keeping tight the 224,000 bolts used in each hangar.

The first contract of the Byrne firm pertaining to the hangars dealt with bolt tightening. In this work a travelling crew of highly specialized workmen was indicated. The demand was for men who not only could do the manual part of the operation, but also work at considerable heights with little or no scaffolding. Moreover, the scaffolding had to accompany the crew from station to station.

The first of these problems was

solved when it was decided to employ derrick or rig builders from the oil fields for the job. These men were accustomed to working on high structures with the same ease that the average mechanic works on the ground.

The necessary scaffolding had to be developed with two things in mind —mobility and ease of access to the work. It was decided that the riggers could reach the bolts at the joints in the lower chord of the trusses by climbing up the ladder steps nailed on the back of this chord by the original contractor. However, once the workmen were on the lower chords, scaffolding had to be vailable to provide access to the many other bolts in the trusses not accessible from the lower chords, such as those in the knee braces and in the purlins. It was also necessary that the riggers be able to get from one truss to the next without descending to the ground, which would have resulted in a loss in productive time.

Two simple types of scaffold were selected. Light-weight reinforced staging 22 ft. long was used to travel from truss to truss, the trusses being on 20-ft. centers. The other type of scaffold consisted of several sets of 1-in. dia. steel rods, which could be hooked over the roof purlins to form a rest for pull boards equipped with light strap irons to prevent splitting (Fig. 2). The rods were spaced about 2-ft. on centers and at the lower end were formed into an L-shaped hook that served as a support for the boards.

By using extra rods the boards were worked along from one end of the hangar to the other, as was the staging. Ropes attached to each end of both types of scaffolding enabled the riggers to readily move them along the hangar. When work on one side of a hangar was completed, the scaffolding was lowered to the floor and hoisted on the other side.

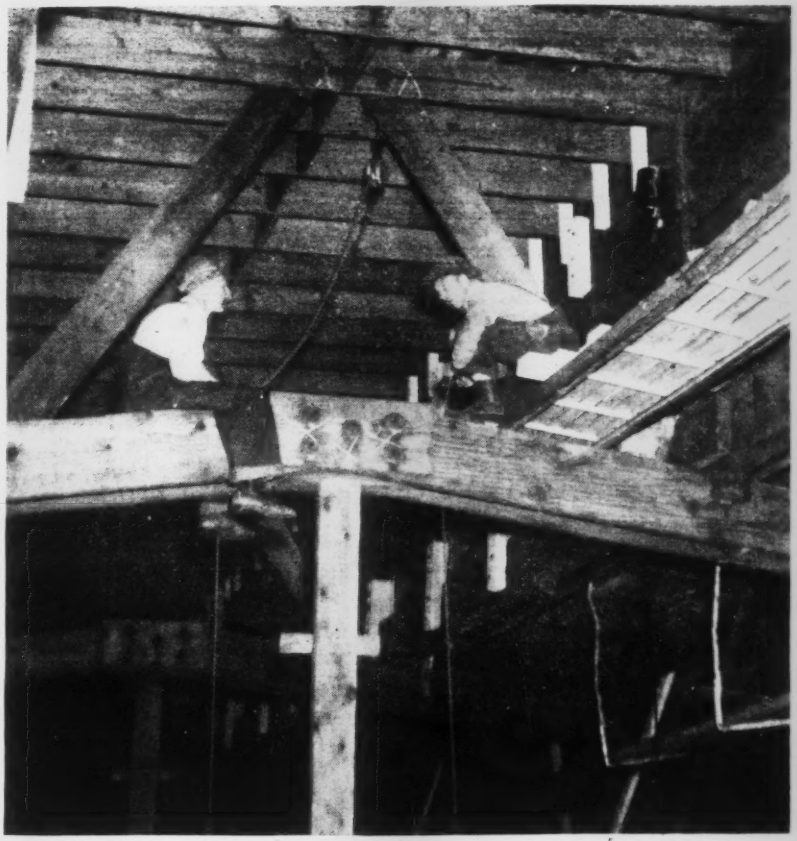


***Fig. 2. The scaffolding used by the crews in repairing the trusses is of two simple types—the staging shown at the upper right spanning between chords of the trusses and the pull boards suspended in L-shaped hangar rods hooked over the purlins as at the right. Both types of scaffolding are easily moved ahead as work advances.***

#### Same methods for repair work

When the Byrne Organization entered into contracts in the complete repair program it was decided that there was no need for developing a new type of scaffolding, the feature of mobility still being paramount.

The repair work now underway consists of replacing a few of the badly split members and the installation of light-weight knee braces extending from the trusses to the purlins. In addition, diagonal cross pieces or battens 1-in. thick are added between the two timbers forming the lower chords of the trusses, one set of battens being nailed to the top edge of this chord and another to the bottom edge (Fig. 1). Some sections of the top chord are strengthened in this manner, as are a number of the diagonals.

The largest pieces for the latter work requires only 2½ b. ft. of lumber, but lumber requirements total about 3,200 b. ft. per truss. Nail requirements total 180 lb. per truss, while some 328 bolts with washers are also needed.

All the new lumber installed is cut to the desired length with power saws assembled at a central point on the floor of the hangar. At this location the pieces are made fire-resistant by being spray painted with paint containing titanium pigments, borax and boiled linseed oil.

The present crew for the strengthening work consists of a superintendent, eighteen first-class riggers on erection, four second-class riggers on fabricating the lumber, one painter and a helper, and six laborers handling and hoisting materials. The lumber required to completely strengthen one full trussed arch is fabricated, painted and erected in ten working hours.

The time required for the 30-man crew to repair one hangar while working a 50-hr. week is about 10 weeks. This progress indicated the success of using the scaffolding and methods selected.

The work is being done by the Navy's Bureau of Yards and Docks, of which Rear Adm. John J. Manning, CEC, USN, is chief. Captain Ira P. Griffin, CEC, USN, is in charge of the work on the East Coast.

# Fighting the Floods at St. Louis

**J. R. Carr**
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***Editor's Note**—Supplementing the previous news account of damage caused by the recent floods of the Mississippi River (ENR, July 10, vol. p. 19), the following is an over-all report on flood-fighting methods of the St. Louis District, Corps of Engineers. Details of the battle are chronicled, together with a brief description of the various types of repairs made during the emergency.*

ALTHOUGH the full extent of damages caused by the unprecedented combination of floods on the Mississippi and its tributaries during 1947 will not be known until the Corps of Engineers has issued its detailed report on the estimated damages and flood-fighting costs, an on-the-site estimate made July 2 when the river crested at 40.3 ft. on the St. Louis gage placed the total cost of repairing levees within the St. Louis District alone, at a minimum of $3,500,000.

A true appraisal of the cost of levee repair is difficult since one of the major problems is whether to restore many privately-owned substandard levees in kind or to reconstruct them, where authorized, to Corps of Engineers standards.

Perhaps the most significant aspect of the recent floods, from an engineering standpoint, is that all levees in the Upper Mississippi Valley Division built to present authorized standards proved ample, both as to section and freeboard. Those that failed were so-called substandard levees, many of which were privately-owned while other had been built by the various levee districts.

First-hand accounts of the many difficulties encountered by the Army Engineers in their flood-fight up and down the Mississippi almost universally agree that the two chief impediments in raising and strengthening levees during the floods were (1) lack of proper maintenance for the past several years and (2) difficult access to the levees.

"If the levees had been adequately maintained and had there been reasonably good access to them by land, we could have saved 50 percent of all levees that failed in the St. Louis District, with the exception of a small number that had been built too low," declared Col. R. E. Smyser, Jr., district engineer of the St. Louis District, Corps of Engineers.

Local interests rarely have shown the capacity for foresightedness to properly patrol and maintain the levees during non-flood periods. Consequently, when a flood emergency arises flood-fighting crews must hack their way through tangled underbrush and half-grown trees that have been permitted to overrun the old levees. Unpatrolled levees honeycombed with rodent burrows offer little resistance to rising floods and are most difficult to strengthen.

Federal regulations, for many years, have required that local drainage districts assume the responsibility of maintaining all levees, including those built by the government. Such maintenance has been adequate.

It would not be far wrong to say that the Army Engineers used almost everything in the way of flood-fighting equipment, with the exception of helicopters. Where it was possible to operate mechanized earthmoving equipment, the battles to save endangered levee sections were, in the main, successful. Where land access was not possible, it was a question of hand labor with sandbags transported by anything that would float.

A reasonably accurate list of power equipment used in the St. Louis District, which extends from Saverton, Mo. just above Louisiana, Mo. to Cairo, Ill. includes 18 jeeps, 9 earthmoving scrapers with tractor unit, 12 dump trucks, 11 weapons carriers, 6 "ducks", 4 "weasels", twelve 2½-ton cargo boast, 19 trucks of various sizes, 22 passenger autos, 1 ambulance, a repair truck and one wrecking truck. About one-half of this equipment was furnished by Fifth Army Headquarters, and the remainder by the Corps of Engineers.

As further evidence of the tremendous problem of supply involved in a flood-fight of this magnitude, the following is a summary of expendable and smaller units of equipment used.

Some 3,500,000 sandbags; 200,000 b. ft. of lumber; 110,000 lin. ft. of

***Fig. 1. First line of defense in levee protection was the ubiquitous sandbag.***

snow fence used as levee topping to prevent or retard failure by slippage of the levee embankment; 110 assault boats and 20 storm boats for the transportation of men and materials; 110 outboard motors; 35,000 carbide flares; 32 portable electric light plants; 2,500 rubber boats and a multitude of smaller items.

### Extensive repairs needed

Extensive repairs will be necessary to those well-known levees mentioned in this report as having failed by one cause or another, as well as a host of lesser known, smaller levees. Little damage was suffered by such levees as Perry County back levee, Columbia, Preston and Kaskaskia Island—all of which were designed to provide a 1-ft. freeboard for floods having a frequency of flow of once in 50 years, and constructed to current standards of the Corps of Engineers.

As would be expected in a flood of this magnitude and duration, damages to the levees included all known types of failures. In addition to many miles of wave-wash damage, there will be many crevasses to refill as well as "blueholes" often scoured to a depth of 50 ft. and large enough to hold a 5-story house.

Based on years of flood-fighting experience, the Army Engineers have perfected methods of emergency levee protection to cope with any situation that may arise. The most common repair is raising the height of levee by installing a sandbag topping to prevent overtopping. This is applicable for short lengths where the raise required is not more than 3 ft.

In this case burlap bags, half-filled with earth and weighing about 40 lb. each, are laid parallel to the levee crown for the first layer, crosswise for the second layer, and so on.

Where wave action is not severe, a combination earth fill and sandbag capping is more effective in preventing seepage through the new topping. When destructive wave wash is anticipated, the sandbag capping is protected by timber flash-board nailed to 2x4-in. posts driven along the river side of the levee.

Other emergency repairs include box levee capping for raises over 3 ft. which utilizes a board fence along both sides of the levee, with the intervening area filled with earth.

Temporary revetment employed to combat destructive wave-wash action includes both the vertical-board type where wave-wash is severe and the horizontal-board type where it is not so damaging. Both types of revetment are reinforced with timber bracing driven along the riverside of the levee, with the vertical boards being driven into the levee and the horizontal boards being nailed to the bracing.

*Fig. 2. Sand boils were controlled with sandbag rings (top), while planes of seepage were drained and weighted down with a layer of picket snow fence topped with a mat of sandbags (bottom).*

### Protection of sand boils

One of the most troublesome and potentially dangerous threats in any flood-fight is the sand boil that usually occurs from 10 to 300 ft. back of the landside toe of levee. It results from a transfer of pressure head on the riverside through a porous stratum extending through or under the levee. This results in water erupting through the ground surface behind the levee and forming a sand boil.

If not checked in time, a sand boil may form a cavern under the levee which eventually subsides causing overtopping at that point. Or, it may undercut and ravel the landside toe, resulting in a sloughing of the slope. In addition, a closely grouped cluster of small boils, often almost unnoticeable, may cause a flotation of the soil, reducing the shearing strength of the material and causing failure of the slope through sliding. Sand boils discharging clear water are not deemed dangerous unless the rate of flow becomes excessive.

Best method of treating sand boils is to construct a ring of sandbags around the boil, building up a sufficient head of water within the ring to check the velocity of flow. The ring is not carried high enough to shut off the flow entirely, however, as this might cause additional boils nearby.

In building the rings, the area to be covered with sandbags is cleared of debris and scarified to provide a water-tight bond between the natural ground and the sack ring. The base width of the ring is laid out to at least 1½ times its height to give ample stability. Sand bags are laid in the shape of a ring around the boil, with

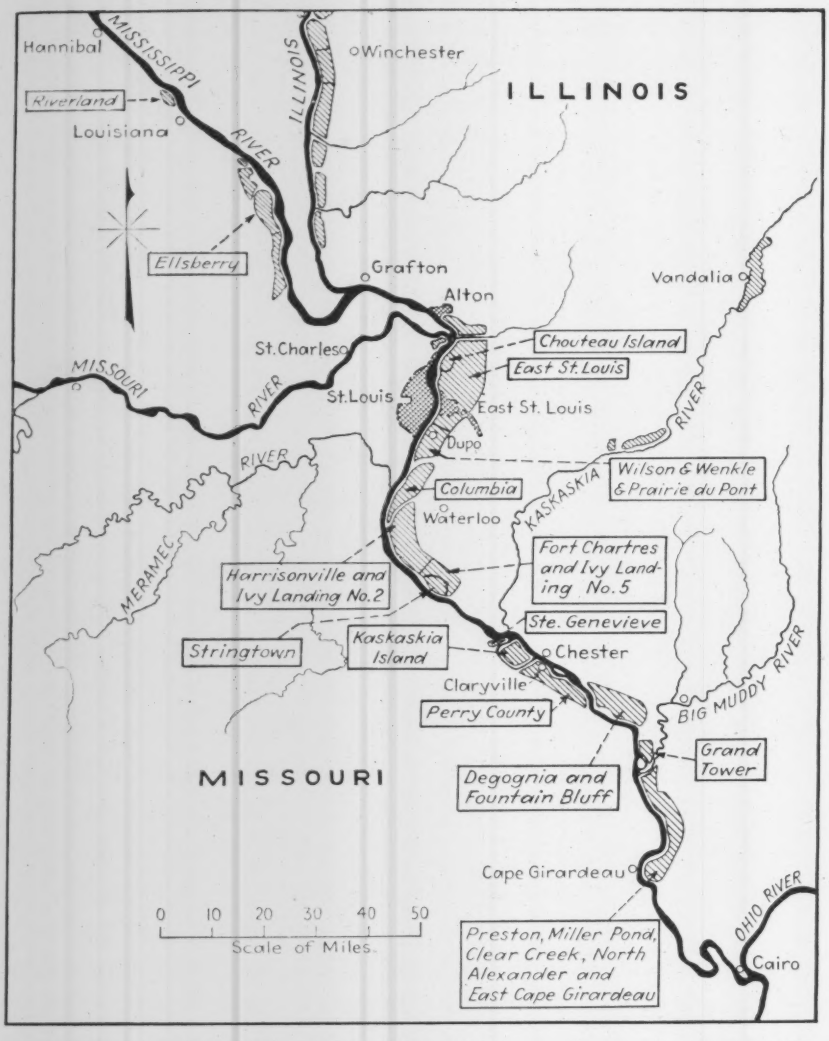



***Fig. 3. Some 485,000 acres of rich bottom lands are protected by levees in the St. Louis District of the Corps of Engineers. Shaded areas indicate some of the better known levee districts.***

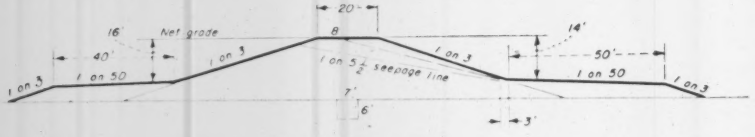



***Fig. 4. Levees built to authorized federal standards, indicated by this typical cross-section of the Preston levee, suffered little damage from the flood.***

joints staggered and with loose earth between all bags.

Actually, there were three separate floods in the St. Louis area this year —one of 13-days duration in April, a three-day flood in May, and the major flood that began June 8 and crested July 2 at 40.3 ft. on the St. Louis gage, coming within 1 ft. of the all-time record set in 1844. By way of explanation, the Mississippi is considered in flood at St. Louis when the gage reading there reaches 30.0 ft.

A comprehensive picture of the flood fight waged by the Corps of Engineers as the various crests moved down the Mississippi from Hannibal, Mo. to Cairo, Ill. can be illustrated best by a calender of major events between June 8 and July 5.

June 8—General mobilization of flood-fighting crews and equipment at the Riverland and Elsberry levees, near Louisiana, Mo. in an all-out effort to save those two large levee districts from inundation. At the same time, major units of the Corps of Engineers' floating equipment were coordinating their efforts with the American Red Cross and the U. S. Coast Guard on rescue and relief of distressed residents.

June 10—The Riverland levee failed, flooding 5,900 acres of land. Plans were being made to dynamite the Elsberry Annex levees, as a last resort, to save the main levee.

June 16—Over 400 men were engaged in strengthening levees at Stringtown, Murphysboro and Degognia; having filled and placed over 75,000 sandbags in the preceding 18 hours. By this time some 100,000 sandbags had been thrown into the fight to save the Elsberry Levee District. Operating motors were removed from Locks 20, 21 and 22 to prevent their flooding by the rising Mississippi, thus tying up barge traffic at these points from 48 to 72 hours.

June 22—Despite the placing of an additional 100,000 sandbags, the Elsberry Annex levee failed through a break in its upper end, flooding 3,600 acres of land. The Army Engineers then dynamited the lower end of this levee to relieve pressure on the remaining Elsberry levee system.

June 26—The flood rose to 37.6 ft. on the St. Louis gage, and residents of the Stringtown-Fort Chartres and the Degognia-Fountain Bluff levee districts were warned to evacuate those areas.

June 27—Failure of the Stringtown-Fort Chartres levees occurred by overtopping, flooding 11,000 acres of land. The Degognia-Fountain Bluff district, involving 29,000 acres, was becoming more critical. Evacuation of all residents was under way and the fight was approaching a climax. In addition to the hundreds of men pressed into service by the Corps of Engineers, 700 Army troops had been dispatched from Scott Field to aid in the fight. A Military Police battalion of 350 men had arrived from Fort Sheridan, Ill., and three officers together with 64 enlisted men of the Army Recruiting Service from various sections of Illinois had volunteered their services, using their own transportation.

July 1—Extremely heavy rainfall in the St. Louis area intensified flood conditions and turned what had

promised to be a victory for the flood-fighters into a serious setback on several fronts. The St. Louis gage stood at 40.0 ft.—Prairie Du Pont, Degognia, and the lower end of the large Chouteau-Nameoki-Venice levee—all either failed or were overtopped, flooding a total of 36,500 acres. One-million sandbags (eleven carloads) had been received by the St. Louis District of the Corps of Engineers, and another million were on the way.

The main East St. Louis levees were considered in no immediate danger. Perry County levees below St. Louis were holding, as were the Preston levees near Cape Girardeau—Local radio stations were interrupting their regular programs to broadcast the Army Engineers' orders for evacuating areas involving Dupo, Prairie Du Pont and Carondelet communities.

July 2—The Mississippi crested at St. Louis with a 103-year record high of 40.3 ft. At 3 A. M. it was necessary to dynamite the lower end of the Degognia-Fountain Bluff levee to equalize the head of water outside the levee.

July 5—With the St. Louis gage reading 39.0 ft.—a drop of 1.3 ft. from the July 2 crest—the brunt of the flood had safely passed although many miles of saturated and weakened levees throughout the entire St. Louis district were still critical. Some 3,500 men were still working around-the-clock to sandbag the river into submission at threatened points.

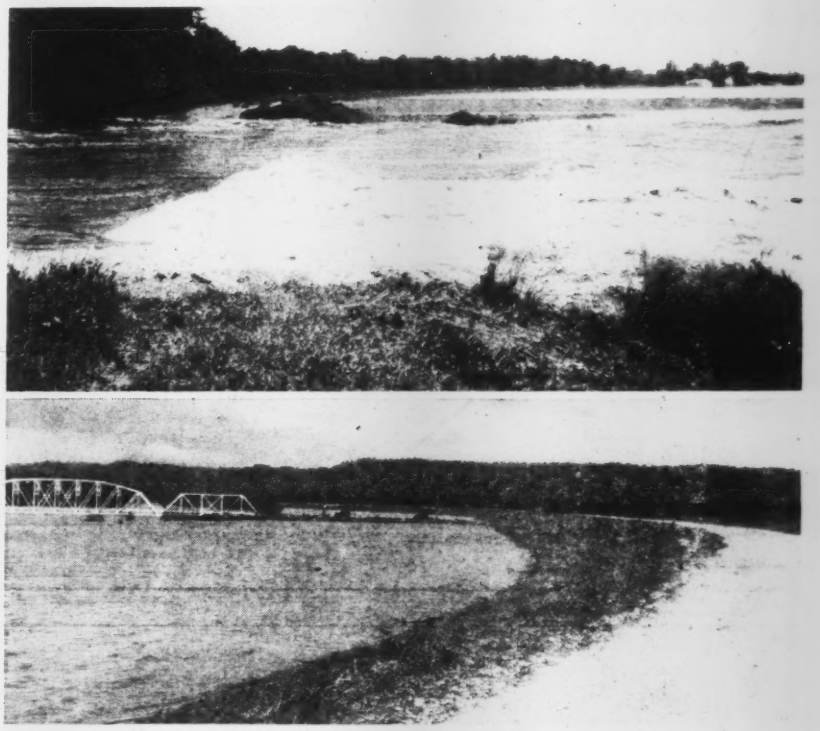


***Fig. 5. Privately-owned levees of substandard design and section (top) crevassed, flooding valuable farm lands (center), while those built to federal standards, such as the Preston levee (bottom), suffered little damage from the floods.***

### Organized flood-fighting

Although the total flood damage in the St. Louis District looms large both in acreage inundated (213,000 acres) and property damage ($12,500,000, the fact that these damages did not reach astronomical proportions is due in large part to the efficient and well-coordinated flood-fighting organization developed by the Corps of Engineers in that district.

Headed by Col. Smyser, who operates in close liaison with Col. Clark Kittrell, division engineer, Upper Mississippi Valley Division, the emergency flood-fighting plan was established on the basis of the existing organization of the St. Louis District.

Thus, L. B. Feagin, head engineer, serves as executive flood officer, with his assistant, E. J. Harrington, handling administrative and supply problems. Donald S. Blair, chief of the Construction Division, has the responsibility of the areas protected by levee systems, while the unprotected areas and all evacuation are the responsibility of Alan A. McFadden, chief of the Operations Division. E. H. Shutt is technical information officer of the St. Louis District.

Mobilization of the flood-fighting organization is actuated in two phases. When rising waters reach flood stage the entire district is alerted and put on "limited mobilization." During this phase each key man's assignment is reviewed and the availability of plant and equipment is checked.

When the flood approaches a critical stage the district enters its "general mobilization" phase and preparations are made for actual flood-fight operations. Skeleton forces are activated as rapidly as possible and expanded as required to meet the situation. At the same time the flood-fighting headquarters, in the Federal Building, in St. Louis, goes on a 24-hr. schedule to direct flood-fighting activities by telephone and radio throughout the entire district.

To expedite repair and strengthening of the existing levees, the levee-protected area (470,000 acres) is divided into nine areas, with a key-man in charge of each. These areas are further divided into from two to five sectors, each in charge of a sector engineer. The unprotected area of the St. Louis District is divided into five areas, each headed by a key-man.

Although the space does not permit mention being made of the scores of engineers who played prominent roles in the St. Louis District's fight with the Mississippi, those in direct charge of protecting some of the better known levee districts are as follows:

Degognia and Fountain Bluff, L. F. Trost and H. C. Shaver; Fort Chartres-Ivy Landing, and Stringtown, I. A. Fietsam; Prairie Du Pont, Herman Clark; Elsberry Annex, Lynn Dillow; Chouteau Island, Prentise Lane; Perry County and Kaskasia Island, Lowell C. Oheim; and the East St. Louis levee district, E. W. Hammack.

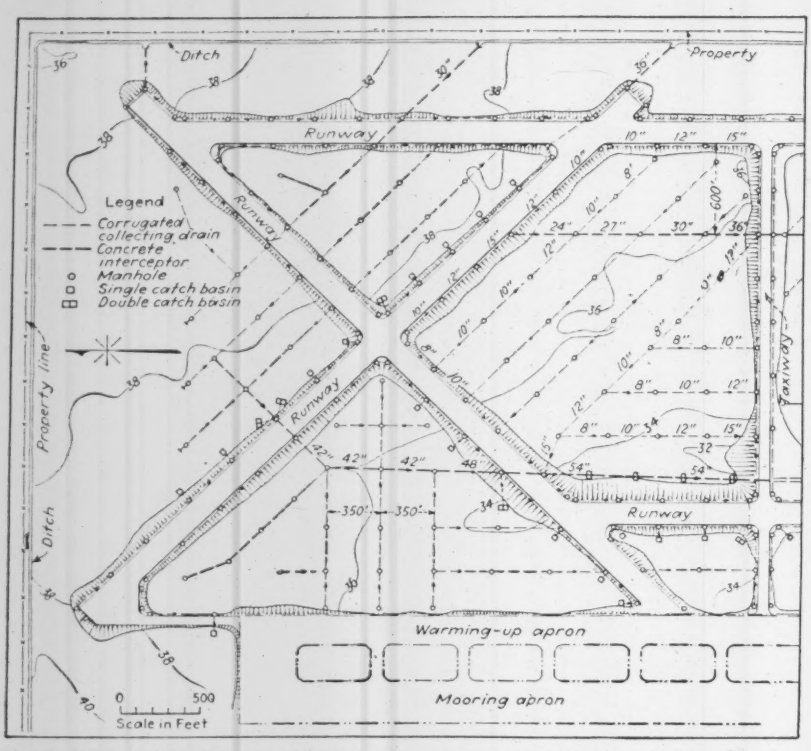



*Fig. 1. Halt plan of Ellington Field showing the location, type and size of drains.*

# Combination Airport Drain Proves Its Value

**John M. Robertson**
Engineering Department, Armco Drainage & Metal Products, Inc., Middletown, Ohio

***Contents in Brief**—An inspection of Ellington field, Texas, after five years of operation demonstrated that the combination drains used there extensively were adequate to free the field of surface water quickly and to prevent saturation of the material underlying the runways and aprons.*

The value of the combination drain as a means for removing surface water and providing a stable subgrade was demonstrated at Ellington Field, Texas, one of the busiest of wartime fields, under abnormal rainfall conditions. Now that restrictions have been lifted, it can be stated that this was one of the fields described but not identified in *Engineering News-Record*, June 4, 1942, vol. p. 906.

The following information as to the functioning of the drainage system of that field was obtained last year after it had been in service five years

Ellington Field is near Houston, Texas. It was used during World War I as an all-over sod field, and was completely rebuilt and enlarged in 1941 to accommodate the planes of World War II. After reconstruction it was the largest medium bomber training base in the country, covering 1,192 acres with a total paved area of 990,794 sq. yd.

In this area the topography is flat with slopes averaging less than 0.5 percent. The average annual rainfall is 45.92 in. The predominant soil types vary from heavy clay to silty clay and are subject to considerable shrinkage when drying. Watertable elevations varied from a few feet to 10 ft. below the surface. These conditions made solution of the drainage system a difficult problem in the complete design of the field.

A plan of about one half of the field is given in Fig. 1, which is reproduced from the article referred to above, to indicate the arrangement of the drainage system. Drains along all runways and aprons are of a combination type (Fig. 2), which act as storm drains and also function as a base drain and subdrain where the watertable is intercepted. Intermediate areas are traversed by a system of perforated-pipe laterals with pervious backfill and catchbasins. These lines are all perforated corrugated-metal pipe varying from 2 ft. to 5 ft. in depth with the average cover being approximately 3 ft. They have satisfactorily withstood severe wheel loadings from planes much heavier than provided for in the original plans.

Catchbasins of the type shown in Fig. 3 were placed along all runway and intermediate area drains at about 350-ft. intervals. One of the primary advantages of this type of installation is the quick removal of surface water to prevent softening of the sodded areas by infiltration.

The drainage design was based on a 1-year frequency storm for one hour equal to 1.75 in. Rainfall data disclosed that during the last five years as high as 50-year-frequency storms were encountered. A two-hour storm of 6.05 in. was recorded, also in the same period a 1-hour rainfall of 4.26 in. Rainfalls exceeding two inches an hour occurred four times during the 5-year period. There were no reports of the field ever being out of operation because of excessive ponding, despite the abnormal rainfalls.

### Results of the inspection

Since the primary purpose of a drainage system is to improve surface conditions, the inspection consisted of examination of paved and turfed areas as well as the drains.

Although the pavement slabs were designed for medium-weight bombers, they were subjected to landings of B-29's without serious damage. The only evidence of cracking was near joints on the warm-up aprons

where the heavy planes were parked. This indicates that the subgrade was giving good support and the base drainage mat was satisfactorily conducting water from under the pavement to the combination drains.

The sodded areas revealed little evidence of washing or erosion. This was surprising since the vegetation was sparse and coarse.

Inspection of the actual drainage lines and porous backfill or filter material showed them to be in very good conditions. There was absolutely no evidence of breakage, disjointing or malalignment. The capping or top material, (Fig. 2), of crushed rock was open, free from silt, and functioning properly along all runways. One exception to this was several hundred feet of pervious cap along an apron, which was partly silted up as a direct result of sloping the sodded area in the immediate vicinity toward the drain. This could be easily corrected by resloping this area in accordance with the design specification, which called for all sodded areas to slope away from runways, taxiways and aprons.

There was no settlement of the capping material and it was still firmly bound with asphalt. Specifications for this material called for no more than 5 percent passing a 1-in. screen, and no more than 5 percent retained on a 2-in. screen. This was bound together with 3 to 5 percent of asphalt emulsion, passing federal specification SS-A-674.

Filter material, or backfill around the pipe, consisted of gravel graded within the following limits.

| | Percent |
|---|---|
| Passing $\frac{3}{4}$" screen | 97 to 100 |
| Passing $\frac{1}{2}$" and retained on $\frac{1}{4}$" screen | 60 to 80 |
| Passing $\frac{1}{4}$" and retained on 10-mesh sieve | 10 to 20 |
| Passing 10-mesh sieve | 0 to 6 |

Although this material is performing well, it is much coarser than would be recommended today. Shortly after installation the U. S. Engineers published findings from experiments on filter materials which indicated that a gradation equivalent to that of standard concrete sand or finer was necessary in most soils to prevent particle infiltration from trench side walls.

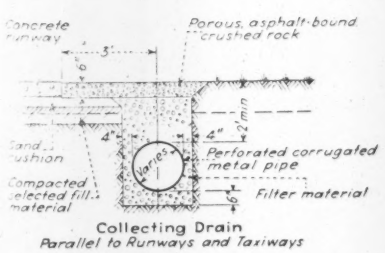



**Fig. 2. Type of combination drain used along all runways and aprons.**

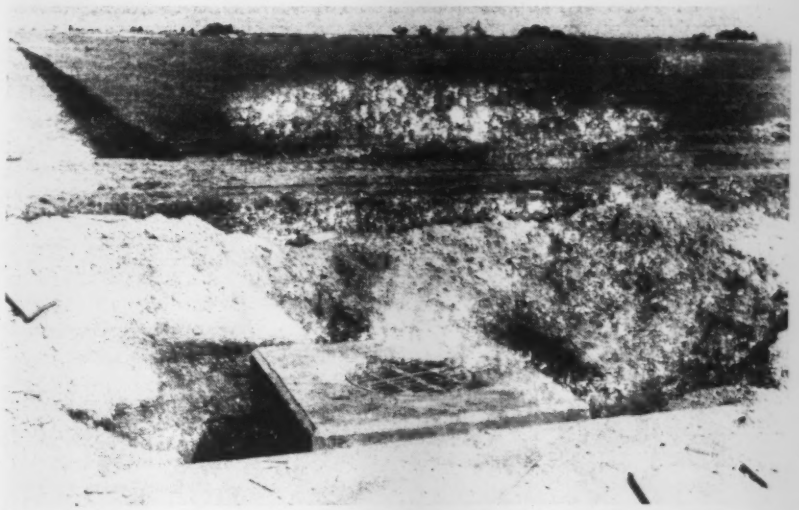


**Fig. 3. Catchbasins of this type were installed along runways. At the upper left can be seen the asphalt-bound crushed rock covering one of the trenches across the sodded area.**

The drainage system was designed to permit cleaning and flushing, but there is no record that this was ever necessary. At no point where the perforated corrugated metal pipe could be examined was there any silting. Observation at outfalls and in catchbasins revealed no collection of sediment.

Nearly all lines were carrying a trickle of water, which was subsurface drainage since there had been no surface runoff for more than 48 hours.

The investigation showed that the entire drainage system was in excellent condition after five years of operation. Field personnel stated that at no time did storms cause flooding of runways, and that they were well pleased with the manner in which the water was removed. During the war, little maintenance work was done on the field, and many items that would be considered essential in normal operations were deferred. For example, expansion joints were not sealed. This would help prevent the infiltration of water into the subgrade at what is probably the weakest point in the pavement.

Design of Ellington Field was done in the U. S. Engineer's office at Galveston, Texas. Colonel Hewett was district engineer, while Colonel D. W. Griffith was engineer in charge of operations. H. R. Norman served as head of the engineering division, and T. W. Elam was chief of the design section.

## Slum Modernizing Costs Soar

Cost of rehabilitating boarded-up slum buildings in New York to house tenants forced off sites of housing developments is exceeding estimates according to the National Association of Housing Officials.

Spiraling construction prices have boosted to $4,400 the cost of rehabilitating the average slum apartment to meet standards of sanitation, privacy, and safety. When $6 million was borrowed from the state last September to finance the rehabilitation project, costs were estimated at $3,500 per apartment.

Cost increase during the past six months have reduced the number of apartments that can be rehabilitated with the state loan from 1,714 to 1,364. The New York City housing authority reports that rehabilitation of the reduced number of units is being continued despite inflation only because of the desperate need for housing families now on site of planned public housing projects.

# How Can Local Governments Cope With Today's Problems?

***Editor's Note**—The phenomenal growth of American cities in the last forty years is strikingly underscored in a report recently released by a committee of the Council of State Governments. Predicting that the trend will continue with increasing complexity four recommendations are offered for functional improvement of local governments: (1) grant greater powers to local units; (2) subject these powers to flexible state administrative supervision; (3) strengthen local revenue systems; and (4) streamline local government through consolidation.*

LOCAL GOVERNMENTS have grown tremendously since the beginning of the century. New services demanded by popular progressiveness have been added steadily. From 1903 to 1940 expenditures have mounted 522 percent. Simultaneously the functions of state governments have multiplied 1,700 percent, increasing expenditures from $200 million to $3.6 billion. One major city, for example, carried on 24 activities in 1824, but by 1942 this number had grown to 396—an increase of 1,500 percent.

General laws and home rule provisions giving broad grants of state authority to local units is proposed. State administrative supervision rather than control by legislation would offer a more efficient means of regulation and a wider scope of freedom to small units. At present, relations between state and localities are frequently so technical, so complex, and so changeable that legislative control is ineffectual in coping with today's conditions.

Since administrative supervision cannot become effective without qualified public servants, the adoption of the merit system to cover executive personnel is recommended for all states.

To provide coordination, a single agency to deal with local problems should be established in each state government. Its work would include collection of fiscal and other reports. Publication of such material would make possible comparisons between localities, and between states—a course that would aid in the determination of intelligent governmental policies. Moreover, codification of laws affecting local units would assist in settling uncertainties in state law.

### Financial power weak

The present weak financial position of cities, counties and special districts is not likely to be strengthened in the future. States are strong financially because of diversified sources of income. Localities are weak in this respect as they derive about 90 percent of their income from a single source—the property tax. State aid ranks second as a source of revenue.

Greater demands for expenditures by localities is another factor in the economic disparity of the two levels of government. Non-economic factors —such as states placing legal limits upon revenue-raising efforts of localities—also contribute to this situation, the committee reports.

Statistics for 1942 on distribution of aid among units of local government indicated that school districts relied most on assistance of greater governmental units in drawing 36 percent of their revenues in the form of aid. Thirty-four percent of county funds came from such aid while townships and towns drew 20 percent. Among cities, those with populations over 25,000 drew 17 percent; cities with population under 25,000 drew 11 percent, and special districts drew 3 percent of its revenues in the form of aid from outside.

Localities are advised to exercise caution in the development of non-property-tax revenues such as sales taxes, local income taxes, amusement taxes and motor-vehicle levies.

Use of such taxes may have important repercussions upon state-local fiscal relations. Many of those new sources of local income are not desirable forms of taxation because they bear hardest on those least able to pay. Another factor militating against use of these revenue sources is that small areas are not efficient revenue collectors because of their limited size.

Conditions for large-scale expansion of local non-property taxes are satisfactory only in large cities. The report states "Appreciable progress toward relative local fiscal independence can be made safely only when units of local government are enlarged through consolidation."

One way by which many localities can increase their revenues is by increasing the yield of the property tax. Means of accomplishing this can be found by improving assessment and collection procedures as well as by re-examining existing provisions on tax limits and tax-exemptions. Careful development of special assessments and adoption of classification principles in assessment are important considerations.

### State aid recommended

"All efforts of localities to improve their fiscal position with their own resources probably will not be sufficient for local needs," the committee observes, as it proposes state assistance to stabilize local revenues and relieve localities from sharp rises in expenditures during depressions. While permitting localities a large measure of local initiative, state aid should be used to establish and maintain minimum standards of statewide service. Furthermore, aid should be given in accordance with local fiscal capacity and need, and should be used to encourage the elimination of archaic and uneconomic units of government.

Granting cities broader discretionary powers through enactment of

municipal home-rule legislation is one way to free legislatures from the burden of local legislation.

State home-rule provisions give cities authority to frame and adopt charters and allows a choice of mayor-council, commission, or council-manager forms of local government. It also gives municipalities considerable authority to consolidate departments or create new ones without preliminary state action.

Thus, home rule not only frees municipalities to act on their own in solving local administrative problems, but reduces the burden of special legislation currently hampering many legislatures. Eighteen states have provided for local home-rule.

Legislators in states without home rule, or where it is not being utilized, must devote so much time to consideration of individual local problems that they often cannot give important statewide legislation the consideration it demands.

#### Charter system not satisfactory

In eight of the states lacking home-rule provisions, every municipal charter still must be granted by a special act of the legislature. Though the special charter system was once widely used, "its rejection by 39 states is testimony to its shortcomings," the committee observes.

A compromise between the home-rule and special-charter methods is the plan of granting optional charters, used in 14 states. "Under this system, the state provides several schemes of government from which nearly all localities are allowed to choose." Other states classify cities as to population and provide a different type of charter for each class.

The committee says that "the primary argument in favor of city-county consolidation rests on the simple fact that, in urban areas, cities and counties serve the same groups."

There are only eight city-counties in the U. S. today—Baltimore, Boston, Denver, New Orleans, New York, Philadelphia, San Francisco, and St. Louis. In Philadelphia and New Orleans consolidation is complete, while in Boston and New York it is only partial. In four cities, consolidation was primarily a matter of severing city territory from the county, with the city absorbing county functions within its municipal limits. Such "separation" is not recommended, however, because the remnant of the county "does not have sufficient resources" to fulfill its responsibilities.

#### Consolidation will help

There are too many local governments in this country. The 155,000 local jurisdictions in the United States constitute a jungle of governmental units many of which are too small in area, overlapping, and deficient in taxable resources. Local governments should be simplified and in many places enlarged by consolidation to permit effective and economical performance of local services.

This enormous multiplicity produces inequities in tax burdens not in proportion to service rendered, retards use of centralized purchasing, budgeting and other modern fiscal measures, dissipates political responsibility and thwarts citizen control of local institutions, and forestalls necessary community-wide action to meet community-wide problems.

One way to reduce this "fiscal chaos" which stymies healthy economic and cultural growth is by functional consolidation—cooperation by two or more units in performance of a specific governmental activity.

Los Angeles County and its environs are cited as an example of functional consolidation. In that region, more than 200 intergovernmental contracts are in effect under which one unit performs governmental functions for several others. Such contracts cover sales of water, work on streets and highways, recreation, sewage disposal, public utilities, library services, public health, fire protection, and public personnel and retirement systems.

An effective solution of problems of multiplex government would seem to be "structural" consolidation—in which one larger government unit literally replaces and absorbs several smaller units, as in city-county consolidation. This scheme permits construction of local units large enough in population to provide adequate local services and wealthy enough in taxable resources to support a substantial portion of those services.

# Increased Map Demand Emphasizes Mapping Needs

Only about 48 percent of the area of the United States has been topographically mapped in any way, and only about 25 percent of this area is considered adequately mapped in line with modern needs and standards, according to Gerald Fitzgerald, acting chief, topographic branch, U. S. Geological Survey.

At the same time, the distribution of topographic maps has increased nearly five times over prewar requirements. The Geological Survey distributed 704,345 maps in 1940, and about 3,400,000 in 1946. An important factor in the large demand for maps has been the application of aerial photography to mapping, which has made available a far greater number of maps in a shorter period of time than when they had to be based on ground surveys. The recent war also made the general public map-conscious, and the training of troops in map reading has contributed to the increased demand.

In comparison with other countries, the United States has lagged far behind in completing its topographic mapping. Most other nations completed their entire series of detailed topographic maps long ago, and now are engaged merely in keeping the maps revised and up to date.

Although a 10-year program of mapping the United States was drawn up in 1934, to cost an estimated $117,000,000, the average appropriation for the last ten years has been approximately $1,000,000. The Geological Survey is set up with staff and facilities to carry on a much enlarged program, were funds available.

Information with respect to maps may be obtained from the Map Information Office of the Geological Survey, and copies from the Geological Survey, Washington 25, D. C. A circular entitled "General Information Concerning Maps Published and Sold by the Geological Survey" is available on request.

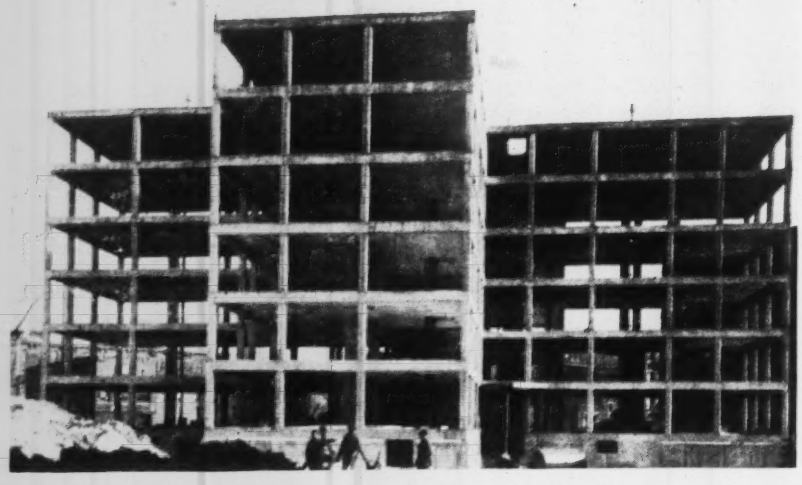


*Fig. 1. Six-story New York City Housing Authority Brownsville Houses in Brooklyn have a reinforced concrete frame and will be faced with brick.*

*Fig. 2. Reinforcing steel for floor slab is laid radially at wing intersections.*

# Close Scheduling Speeds Housing Project

***Contents in Brief**—Erection of the 27 six-story, reinforced concrete buildings of the low-rent Brownsville Houses in Brooklyn, N. Y., was scheduled in groups so that crews for the several trades could move from one building to another for orderly, continuous construction. Basement-pilaster and all column forms were of metal, while wall forms were well-conditioned plywood to provide a smooth concrete surface to be left permanently exposed.*

RAPID COMPLETION of the 27 six-story Brownsville Houses, a New York City Housing Authority low-rent project in Brooklyn, is attributed to excellent planning of construction operations. Close adherence to schedules kept personnel and equipment fully occupied at high efficiency despite winter weather and strikes. The result was construction at a profit to the contractor.

The $13,000,000 project for housing 1,338 families is located on a 17-acre site bounded by Rockaway, Sutter, Stone and Dumont avenues in a congested area in the center of Brooklyn. Only 23 percent of the site will be occupied by buildings.

Six stories high, except for three-story extensions of some wings, the houses, in plan, have roughly the shape of a cross with wings 30 to 33 ft. wide and 34 to 48 ft. long (Fig. 1). Story heights are 8 ft. 6 in.

The structures are on spread footings and have poured concrete foundation walls to well above the ground line. Above this, there is a reinforced concrete frame, with spandrel beams to carry the wall at each floor level.

Exterior walls are faced with an oversize brick bonded to a 6-in. cinder-concrete block backing. The brick is reinforced at all columns by two $\frac{1}{4}$-in. round by 4-ft. long bars placed horizontally at every sixth course. Additional $\frac{1}{4}$-in. dia. reinforcing bars are provided adjacent to the roof spandrel beams. In the top story, bars at corner columns are extended to 5 ft. from the building corner, or to the nearest window opening, and four continuous $\frac{1}{4}$-in. bars are placed around the perimeter of the building in two joints, between the brick of the parapet wall.

The parapet is anchored to the roof spandrel at the corners by a $\frac{3}{8}$ in. rod that has a 4-in. hook and is embedded 1 ft. in the spandrel. At the top of the bar, a nut is screwed tightly against a 7x7x$\frac{3}{8}$-in. perforated plate set horizontally in the parapet.

Spacing of the exterior columns and of a centrally located row of interior columns in each wing is irregular and is governed by architectural requirements. Maximum distance between columns is about 15 ft.

Spandrel beams are 9$\frac{1}{2}$ in. wide by 16 in. deep. The longitudinal beam spanning the central columns is a slab band 10 in. deep and 48 to 60 in. wide. Reinforcing for the floor slabs is placed radially with respect to the band at wing intersections and at the ends of wings. This arrangement permits the use of a slab only 5 in. thick and maintaining a ceiling height of at least 8 ft. 1 in. in all rooms. The undersides of the slabs are finished smooth and painted to serve as a finished ceiling (Fig. 3).

Floors were designed for a dead load of 83 psf., allowing for partitions and asphalt-tile finish, and a live load of 40 psf. For roofs, a dead load of 66 psf. was used, plus 40 psf. live load. For halls, entrance slabs and stairs, live load was taken at 100 psf.

Concrete of 3,000-psi strength was specified for columns from the first to third floors and 2,500-psi. concrete for the upper stories. This avoided the necessity of increasing the column dimensions in the lower stories and made possible standardization of column forms. For floor slabs and beams, 2,500-psi. concrete was used.

The houses were erected in groups of about twelve with the work laid out so that the first two buildings in schedule were one story ahead of the

*Fig. 3. Undersides of floor slabs are finished smooth and painted to serve as ceilings. The cinder-concrete block backing of the exterior wall, in background, will be metal furred, metal lathed, plastered and painted.*

*Fig. 4. Column-footing forms are plywood mounted on a 2 x 4-in. frame pinned at the corners.*

following two, and when the roofs of the first two were poured, two additional buildings were started. This procedure enabled the contractors to have twelve buildings in schedule at all times. Thus, the various trades and the equipment could be kept continuously employed, provided construction operations were timed properly.

At the beginning of each day, it was determined exactly what operation would be started or finished and at what time. This schedule was then rigidly adhered to.

### Special forms designed

The considerable amount of thought given to form design was justified. In speed of erection and stripping, as well as in economy, the forms lived up to expectations.

Forms for the foundation walls were plywood panels made up on 2x4-in. studs, with double 2x4-in. wales held by precut wire ties designed to break 1 in. back from the surface. Panels were made in 4-ft. widths and 6 to 9 ft. high. For ease in assembling them, a line of ties was located at each edge of the panel, and only one line, at the center, was required through the panel. This eliminated time-consuming adjustments to fit the ties to prepared holes in the forms.

Pilasters about 10 in. thick and 16 in. wide were cast integrally with the basement wall. A form made in two sections from 14-gage steel was used as a part of the wall form to give the required shape of the pilaster (Fig. 5). Each of the two sections was L-shaped with a short outward-turned flange at each edge of the L to permit bolting. To each flange that was to be aligned with the wall form a 2x4 was fastened in such a position that the horizontal wales that held the wall forms also held the pilaster form.

Column forms were also 14-gage steel, but these were made up in four L-shaped sections (Fig. 6), similar to those used for the pilasters. Adjustable strips were provided to accommodate changes in column sizes.

To allow for the fact that the spandrel beams are flush with the exterior columns on the outside face and not on the inside, an extension also made of steel, had to be added to two of the sections composing the exterior-column forms to prolong the interior face of the forms to the underside of the floor slab.

In the assembly of these forms for the exterior columns, provision was also made for tying the masonry to the structural frame by fastening to

*Fig. 5. Basement pilaster forms, made by bolting together two L-shaped, 14-gage steel sections, are fitted between plywood wall forms.*

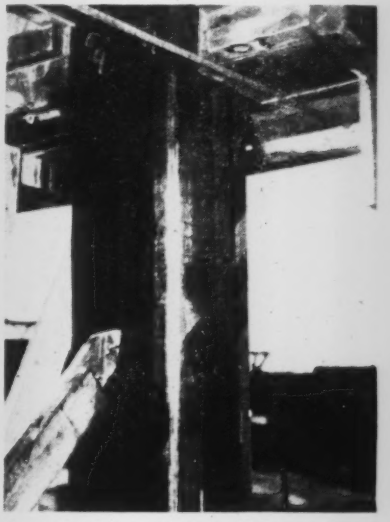


*Fig. 6. Forms for exterior columns, made by bolting together four L-shaped, steel sections, extend past the spandrel on the inside to the floor slab.*

the forms a wood strip to which wire anchors were attached. When the forms were stripped, the wood was also removed, leaving embedded in the concrete a continuous wire loop to which 11-gage galvanized wire anchors were connected at every sixth course.

Shores to support the plywood floor forms were precut to exact size and pre-assembled for installation without the use of wedges. Around the perimeter of the building, a working platform was installed, with safety ropes extended between protruding column dowels. It was supported from below on the exterior row of shoring.

The bases of this outside row of shores were fastened to wood plates firmly nailed to the concrete floor to resist overturning forces due to live load on the working platform and forces transmitted by the spandrel form bracing.

In addition to the use of compression braces to resist outward movement of the spandrel forms, hooked steel bars were clipped to the working platform and either anchored to the floor below or connected to similar hooked steel bars from the other side of the wing. Pressure against the forms was applied by adjusting a turnbuckle attached to the steel bars.

The wood forms were coated with a lacquer-type film, oiled and wetted thoroughly prior to pouring. Concrete came to the job in truck-mounted mixers and was discharged into 1½ cu. yd. buckets that were hoisted by large cranes for direct distribution from the bucket to any point on the structure. Since the buildings are only 33 ft. wide, a crane at each side of the central cross of the structure could reach almost the entire floor area without moving.

Each floor requires an average of about 175 cu.yd. of concrete. As many as four floors, on different buildings, have been placed on one day using the two cranes with a 1½ cu.yd. bucket on each. Average has been more than two floors per day.

When early stripping was desired, resort was had to use of 3,500-lb. concrete, obtained by increasing the cement of the mix. According to the contractor, the increased cement gave a better, more workable mix and practically as high an early strength as would have been obtained by expenditure of the same amount of money for high-early strength cement.

The Brownsville houses were designed by the firm of Frederick G. Frost, architect, with Fred N. Severud, structural engineer. They were built as a combined operation by George F. Driscoll Co. and Moccia Construction Corp. under the supervision of P. L. Moccia. James R. Thorkildsen was superintendent of construction, John L. Kennedy was superintendent over all subcontractors and R. L. Mellick was chief engineer for the contractors. John P. Riley is director of development of the New York City Housing Authority for whom William Brostek is chief of construction, N. B. Jencks, general superintendent, and Frederick C. Hunter, construction superintendent.

## BROWNSVILLE HOUSES CONSTRUCTION COSTS

(Based on contract award prices).

| | | |
|---|---|---|
| I. | A. Total cost of buildings, excluding excavation and footings | $9,008,222 |
| | B. Number of buildings | 27 |
| | C. Number of stories | 3 & 6 |
| | D. Floor to floor height | 8 ft. 6 in. |
| II. | Unit cost (Based on total cost of buildings excl. excavation & footings) | |
| | A. Cost per apartment | $6,733 |
| | B. Cost per cubic foot | $0.89 |
| | C. Cost per construction room | $1,606 |
| | D. Cost per person housed | $1,741 |
| | E. Cost per sq. ft. rentable area | $10.12 |
| III. | Space provided | |
| | A. Apartments | 1,338 |
| | B. Construction rooms | 5,610 |
| | C. Persons housed | 5,175 |
| | D. Rooms per person | 1.08 |
| | E. Gross floor area—sq. ft | 1,030,966 |
| | F. Rentable area—sq. ft | 889,784 |
| | G. Gross floor area per person—sq. ft | 199 |
| | H. Rentable area per person—sq. ft | 172 |
| | I. A.I.A. cube—cu. ft | 10,401,026 |
| | J. Rentable volume—cu. ft | 7,563,164 |
| | K. Rentable space per person—cu. ft | 1,461 |
| | L. Rentable volume per apartment—cu. ft | 5,653 |
| | M. Area, exterior wall—sq. ft | 668,848 |
| | N. Exterior wall per person—sq. ft | 129 |
| | O. Ratio rentable to gross area—percent | 86.4 |
| | P. Rentable volume per A.I.A. cube—percent | 74.9 |
| IV. | A. Date of award of construction contract: | |
| | Foundations | July 8, 1946 |
| | Superstructures | Sept. 25, 1946 |
| V. | Distribution of cost | |
| | A. Primary cost determinants—Basic features (Excavation and footings excluded) | |
| | Type of construction and prevailing practice | Percent |
| | 1. Concrete foundations, concrete frame, concrete arches | 28.2 |
| | 2. Walls & partitions, brick & backup tile & stonework | 16.4 |
| | 3. Waterproofing (WP), dampproofing (DP), spandrel WP (SpWP) | 0.3 |
| | 4. Windows, steel casements, caulked | 2.4 |
| | 5. Roofing, 4-ply-20 yr.-Celotex insulation | 1.0 |
| | 6. Metal bucks, for interior doors | 0.9 |
| | 7. Kalamein apartment entrance doors | 0.6 |
| | 8. Iron stairs & misc. iron—stack, toilet partitions, lockers | 1.6 |
| | 9. Incinerators | 0.1 |
| | 10. Metal furring, lath & base | 3.6 |
| | 11. Plastering, 2-in. solid partitions, none on ceilings | 3.7 |
| | 12. Bath rooms, tile floor & base | 0.5 |
| | 13. Floor finish, asphalt tile—linoleum | 1.5 |
| | 14. Carpentry, wood interior doors, kitchen cabinets, dryers | 4.6 |
| | 15. Glazing "B" quality, ss & ds | 0.4 |
| | 16. Hardware, parkerized finish | 0.6 |
| | 17. Painting, two coats | 2.5 |
| | 18. Heating, vacuum steam, oil-fired | 6.3 |
| | 19. Elevators | 1.8 |
| | Total cost percentage in basic features | 69.2 |
| | B. Secondary cost determinants—Influenced by owner's desires. | |
| | 20. Plumbing—roughing, brass piping | 11.0 |
| | 21. Plumbing—fixtures, enamel on cast iron | 5.2 |
| | 22. Electric—wiring & conduit, switches, ceiling outlets, receptacles | 3.7 |
| | 23. Electric—fixtures, porcelain, stamped brass | 0.4 |
| | 24. Screens, window, metal | ..... |
| | 25. Shades, window, Holland cloth & venetian blinds | 0.3 |
| | 26. Gas ranges, 4 burners, low oven | 0.5 |
| | 27. Refrigerators, electric, 4-cu. ft | 1.9 |
| | Total cost percentage | 100.0 |

Note: Similar cost data on other housing projects were given in *ENR* April 18, 1946, vol. p. 96 and 97 and April 17, 1947, vol. p. 387.

# Comment and Discussion

**Readers' opinions on matters that concern engineers and contractors**

### A Cooperative Undertaking

Sir: In your issue of July 10, vol. p. 28, in the editorial "Independence for Professionals" you give most of the credit to one engineering society. I think this is unfair since other societies labored hard and long in the same matter.

I do not think it is a question of relative merits. I think you missed the point completely because you failed to give credit to the fact that this was the first time that the engineers, including the architects, presented a united front, and that the statement presented to Congress was the statement of the united engineering and architectural profession.

I think this fact, more than anything else, impressed the representatives of Congress.

The committee which presented this joint statement was pictured on the frontispiece of the *American Engineer* for April, 1947, and in *Civil Engineering* for July, 1947, page 48.

The success of this effort is a strong argument for a united engineering society similar to the American Bar Association or the American Medical Association.

SAMUEL I. SACKS
*Philadelphia, Pa.*

[The fact that this was a cooperative undertaking was recognized in an editorial on the advantages of such cooperation in the July 24 issue, vol. p. 105, but the leadership and much of the initiative was supplied by the American Society of Civil Engineers. That, we believe, called for special recognition.]—EDITORS

### To correct the Nail Shortage

Sir: The following excerpts from a letter I wrote to Senator George A. Wilson of Iowa, which was published in the Congressional Record of July 1, may be of interest to your readers:

My company is returning housing nail subsidies paid to us by the RFC in the amount of $3,600, and are waiving claims previously made for $4,420, an aggregate amount of $8,020. Our company is returning this money, and waiving its claims, for the following reasons:

1. It was clearly our responsibility to make as many nails as possible, and we dislike the idea of having the government subsidize us out of the taxpayer's pocket, to cajole us into doing what it was proper for us to do.

2. Through many vicissitudes, we have stood on our own feet without governmental financial assistance for forty-odd years, and we don't want to, nor do we need to, lean on Uncle Sam.

The subsidy has not been paid for nail production since March 31, and I am informed that nail production has dropped. But the black market in steel nails still exists. A decline in production since subsidies stopped indicates to me a lack of responsibility on the part of the industry.

Estimates recently made are to the effect that only 5 percent of the steel production may be reaching the black market. If it is, only talk that, an average black-market price of $150 a ton for the 2,275,000 tons of steel involved represents $341,250,000. That is a lot of steel and a lot of money.

Now, steel which is reaching the black market, and the premium export market, if spread equitably among regular mill customers, would go a long way toward alleviating the shortages everyone faces. I do not suggest that this country should not export steel. I do believe, however, that mills should not charge foreign purchasers premiums for steel because this takes an undue amount from our domestic economy.

It seems to me that without in any way laying themselves open to anti-trust prosecution, the top management of the mills could meet, under the auspices of the American Iron & Steel Institute, and discuss ways and means of exercising self-control. It is suggested that they:

1. Agree to stop making tie-in sales, i.e., scrap for semi-finished or finished steel.

2. Determine from the various governmental agencies the steel needs of the country. Agree to manufacture steel in sizes and types to fill the needs as effectively as possible.

3. Ship steel where it is needed, and not just to territories where there is no freight absorption.

4. Agree not to accept premium prices for steel that is exported.

5. Utilize existing open surplus capacities to the utmost in converting for legitimate customers at legitimate prices.

As for ourselves, we don't get enough steel to justify our company name, and we're staying in business only because we have largely converted to aluminum.

FRANK R. NICHOLS,
*President, Nichols Wire & Steel Co., Davenport, Ia.*

### Competitive Proposals

Sir: Re. your editorial "Competitive Engineering Proposals" in the June 26 issue of *ENR*, vol. p. 997:

I am unalterably opposed to competitive bidding for engineering engagements as you and I would be opposed to this procedure as a basis for selecting our personal physician or legal adviser. You take the position that, inasmuch as codes of ethics restricting competitive proposals are being widely violated, the best way to correct this condition is to condone the deplorable practice by making competitive bidding ethical.

Professional conduct is usually regulated by adopted codes as well as by individual standards of integrity and social responsibility; the function of codes adopted by the various professional societies being intended to restrain those who might be tempted to practice their profession on a dog-eat-dog basis. Reckless competition particularly if manipulated by unscrupulous practitioners results in work of mediocre caliber and ultimate disrespect by the layman for the entire engineering profession. While it is quite feasible to legalize certain iniquitous practices, it is questionable whether the status of the engineering profession can be raised by legalistic manouvers operating on the principle of "if you can't lick 'em, join 'em".

The direct result of competitive bidding regardless of conditions un-

der which it might be carried out must ultimately lead to lowered working standards in engineering offices.

You point out that present violation of code of ethics has the "tacit approval by committees set up to enforce the codes". By what magic will committees which now fail in their objectives regulate the new practice?

You further suggest that conditions under which competitive proposals be permitted be "such as to minimize the possibility of an award being made on the basis of price alone". Of course, you are referring to public works engineering and not engineering for private undertakings, as I can't imagine a business corporation entrusting the expenditure of its stockholders' investments to an engineer who just happened to be the lowest bidder, and that's all. The average public official, however, will generally be forced to award a contract after duly advertising for bids, these being "received, opened and read aloud at the specified time and place", to none other than the lowest bidder. Your naiveté in this respect is rather unique.

You go on further to say that each bid should be accompanied by a statement of the engineer's qualifications, a detailed statement of the services he proposes to render, and the amount of his fee, and then "the public official charged with the responsibility for engaging the services of a competent engineer will have something other than price on which to make a decision". Of course, you are aware that this is the current procedure with perhaps one essential difference, to wit: the personal element. Engineering, especially of a public works nature, is not altogether and most certainly should not be the impersonal, cold blooded business that you appear to make it. A sealed envelope containing the engineer's statement of experience, outline of proposed services and price is generally *not enough*. (You wouldn't hire your secretary that way!). The successful administration of many public works undertakings requires not only engineering competence, but many qualities not reflected in a brochure of experience but which go to make the engineer. The ability to explain, to convince, to lead, to get along, fairness, honesty, diplomacy, and breadth of interest beyond one's own specialty—you know them all—are part and parcel of engineering services. Are these worth anything? In dealing with the public, as engineers in public works must, *these are worth everything!* Winning the confidence of your client—which the sealed envelope bid makes impossible—is the reason that one engineer succeeds in landing a job which another engineer fails to do. This procedure enhances both the public's welfare and the engineer's welfare.

If bidding by the "sealed envelope method" is to become the accepted practice, it presumably will be unethical for an engineer to meet with the prospective client prior to submitting his "bid" in order to discuss the nature of the problem, to guide the prospective purchaser of engineering services as to the extent of such services, or perhaps point out the necessity for special procedures involving research, test plants, model tests, financing methods, organizational matters, and a multitude of considerations that the particular problem may warrant. The hiring of an engineer is still a mystery to most people, including public bodies —so that these preliminary talks between engineers who are invited by such boards for the purpose is a real public service which the engineer performs. True, only one engineer is ultimately retained, but all engineers who participate in such preliminary guidance contribute to better understanding by the public of the work of the engineer and in most cases at least, the scope of engineering services finally utilized will be properly suited for the case. But in lieu of this procedure, you recommend that the customer who frequently understands no distinction between the engineering specialties, let us say, be left on his own to make a wise choice from a number of sealed bids, involving wide variations in scope of services proposed and confusion resulting from the accompanying variation in fees.

And, finally, since the relationship of engineer employer to engineer employee is somewhat of an extension of the relationship of engineer to client, would you suggest that an engineer employer fill a vacancy in his staff to the lowest bidder on the basis of sealed proposals? By the same token, appointments to civil service positions in engineering should involve not only competitive examinations testing technical qualifications, but also competitive price, the appointment going to the lowest bidder.

The direct result of competitive bidding might well be to exclude engineering from the professions, to destroy the respect and confidence of people for engineers, to affect adversely the public interest as well as the economic welfare of all engineers from principal to apprentice. If engineers, as well as engineering, are to be reduced to an impersonal entity whose qualifications can be readily determined from a chart or tabulation prepared from data in a sealed envelope, then lets adopt competitive bidding. If we don't want these things, let's keep our code of ethics intact and restrict competitive bidding, but lets make it work!

In competitive bidding you say that "the engineer whose proposed fee is conspicuously low will immediately be in the spotlight". Why not turn the same spotlight on the engineer who violates the present ethics of no competitive bidding? Engineering firms have recently submitted "bids" on several well known municipal jobs. Have their names been publicized? Would you publish them? You say that an engineer who submitted a proposal at a fee below the state society's schedule "could be challenged and if the engineer—could not satisfy the society as to his capacity to do an adequate job for the amount of his fee" then the state license board could be asked to revoke his license. Why don't state boards revoke licenses for violating the code which prohibits competitive bidding? The attorneys have their occasional disbarments for unethical practice, the doctors have their quacks and illegal practitioners whose licenses are now and then temporarily suspended or revoked. We, too, have our miscreants who should be similarly dealt with.

If cities, in spite of our code, call for competitive bidding, the engineers' themselves are to blame. Yet the remedy is obvious and is entirely in their own hands. If our Society Committees give tacit approval to violation of code of ethics, then demand that these Committees answer for their non-feasance.

M. H. KLEGERMAN
*Alexander Potter Associates, New York.*

# From Field and Office

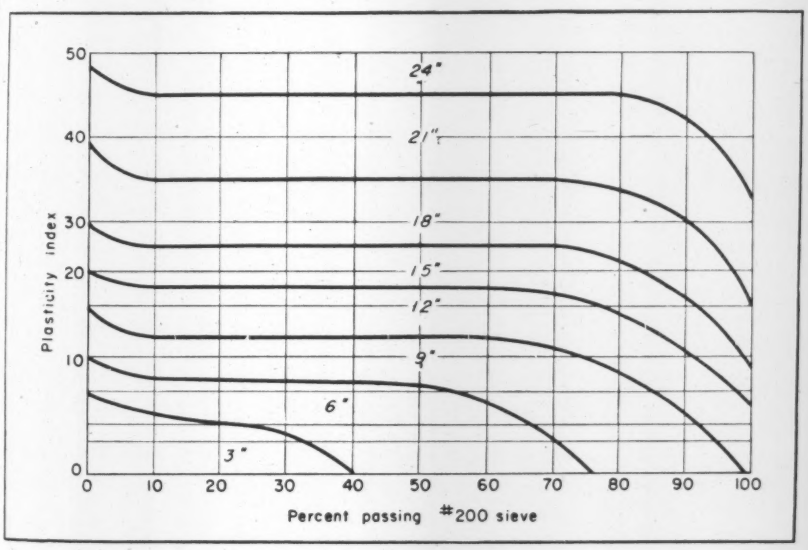
WORKING PROBLEMS AND TIME-SAVING METHODS FOR ENGINEERS AND CONTRACTORS

### Chart Determines Thickness of Highway Base Course

Based on experience with the particular conditions in their area, Arizona highway engineers have developed a chart for determining the thickness of aggregate base course required to support 2 to 2½ in. of flexible type asphaltic pavement. This chart makes use of two soil characteristics which are easily determined, namely, the plasticity index and the percent passing a 200-mesh sieve. Its development has been empirical, based on thousands of plasticity index determinations and sieve analyses and correlated with field observations of road durability made over a period of some 15 years. It is, of course, subject to change for local conditions based upon the judgment of the experienced engineers who use it. Factors which would vary results herein given are degree of compaction of the sub-grade and the base material, the proximity of ground water, climate, anticipated wheel loads, volume of traffic, snow conditions, etc.

To illustrate the use of this chart, assume that a section of sub-grade has a plasticity index of 20 and that 40 percent passes a 200-mesh sieve. In such case the required thickness of aggregate base course would be 12 in.

This chart was developed by the Materials Division of the Arizona State Highway Department, of which H. H. Brown is Engineer of Materials. Mr. Brown cautions that use of the chart, while well suited to Arizona conditions, may be subject to question in other localities.

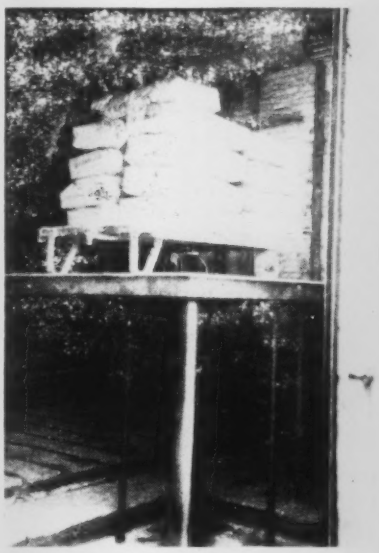



*Thickness of aggregate base course to support 2 to 2½ in. of flexible type asphaltic pavement for average traffic can be determined with the aid of this chart.*

### Air-Oil Lift Speeds Handling of Chemicals

For use in unloading chemicals delivered in bags from railroad cars, operating crews of the Atlanta, Ga., waterworks treatment plant constructed the air-oil lift illustrated by the accompanying photograph. The lift, which was built mostly from scrap material, also has proven a great time saver in transferring bags from storage piles into trucks.

Lifting power is supplied through a 10-in. dia. piston with a maximum travel of 72 in. Air for operating the lift is supplied from a compressor required for other work in the plant. The platform is kept in proper alignment by two 1½-in. dia. guide pipes attached to the platform of the lift and operating in steel sleeves embedded in the foundation slab.



*At little expense handling of chemicals at Atlanta's water treatment plant has been simplified by construction of this air-oil lift.*

The lift was constructed under the general direction of Paul Weir, assistant general manager of the Atlanta water department.

### New theodolite being tested

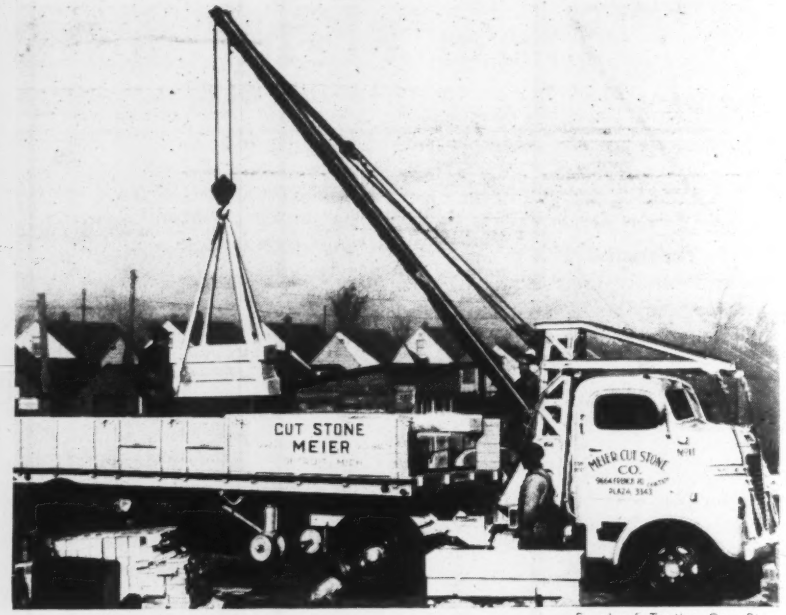
Now under test by the Engineer Research and Development Laboratories at Fort Belvoir, Va., is the first 10-second optical-reading theodolite manufactured in the U. S. Although 10-second theodolites have been built before by American manufacturers, this is the first that is of the optical reading type. Readings may be made directly to 10 seconds and estimated to one second.

The instrument, which was built by Kueffel and Esser in accordance with military specifications, is expected to be of value on second order triangulation surveying and mapping work. It is also considered to offer major advantages on running traverses on military work, since rapid speed will be possible in that the angles will need

*A 10-second optical reading theodolite is under test by the U. S. Corps of Engineers at Fort Belvoir, Va.*

to be read not more than one time.

The instrument, which is extremely compact, is equipped with glass circles, a magnetic yoke compass and rod target, and complete night illumination. It is mounted on an experimental extension-leg tripod considered much more rigid and stable than older designs. Not only is the tripod expected to be sufficiently stable for accurate military mapping, but it appears to overcome the past claim of many civilian surveyors that no extension-leg tripod was sufficiently stable for much of their work.




Fruehauf Trailer Co., Photo

*A new and practical idea has been incorporated into a truck and trailer combination by the Meier Cut Stone Co., a Detroit, Mich., contracting firm. A power crane mounted between the cab and 15-ton trailer handles cargo efficiently. The unit can unload on the second floor, thereby saving time and money.*

## Mobile Screening Plant Made from Obsolete Equipment

Made from odds and ends of old equipment, a mobile screening plant is being used successfully in screening ballast and surfacing for repair jobs where it would have been too expensive to move in crushing equipment. The equipment was constructed at a cost of about $2,000 in one of the Washington State Highway Department shops. It was designed by R. L. Deaver, district maintenance engineer.

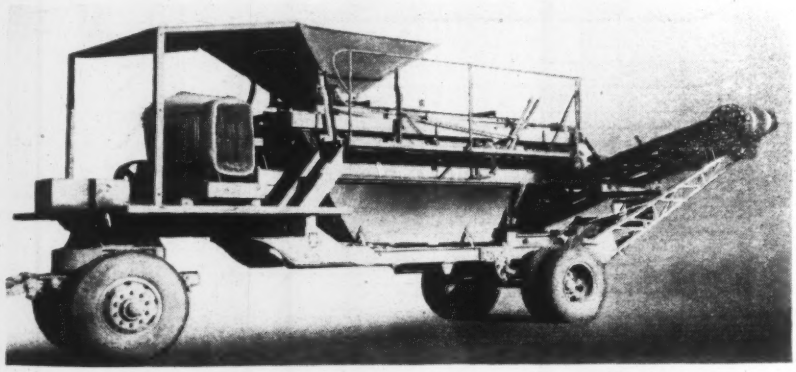
The plant will screen river bar, bank gravel or crushed at a rate of 20 to 40 cu. yd. per hour and a cost of $0.75 to $1.00 per cu.yd.

A frame built on the chassis of an old Liberty truck carries a 3x10 ft. vibrator screen taken from a small portable crusher. The front wheel assembly is arranged to permit short turns and a platform over it carries the power plant, a salvaged model A Ford engine.

Flat and V-belts drive the screen and conveyors that discharge usable aggregates and undersize waste materials. The usable aggregate conveyor discharges to the side but can be swung to the rear on a pivot to permit travel. A metal chute discharges oversize material to one side. When re-screening stockpiles of sized aggregates, three gradations of materials can be secured from one screening operation.

All controls are brought to a platform near the screen so that one man can control all operations. Feed to the screen is manually controlled by a gate on the hopper.

The equipment is less than 35 ft. long and can be towed as a full trailer. It can be used as a secondary screen with a crushing plant. Clarence B. Shain, *Director of State Highways, Olympia, Wash.*



*Made from an old truck and salvaged equipment, this mobile screening plant used to provide aggregates on small construction jobs cost $2000. Power is provided by a Model "A" Ford engine. Centralized controls permit one-man operation.*

# Locks No. 27, Chain of Rocks Canal Mississippi River

*Continued from page 115*

| | Item | Quantity | Government Estimate | Unit Prices (1) | (2) |
|---|---|---|---|---|---|
| 1 | Cofferdam | 1,732.17 lf | $670.00 | $1,400.00 | $1,125.00 |
| 2 | Clearing | lump sum | 15,000.00 | 26,000.00 | 53,000.00 |
| 3 | Excavation; common | 2,500,000 cy | .26 | .30 | .65 |
| 4 | Excavation; rock | 47,600 cy | 4.00 | 10.00 | 8.00 |
| 5 | Stripping | 300,000 cy | .21 | .30 | 1.15 |
| 6 | Backfill | 352,000 cy | .43 | .27 | 1.00 |
| 7 | Fill; crib, stone and sand | 3,300 cy | 1.30 | 3.00 | 6.00 |
| 8 | Fill; sand, for cut off, inter. wall | 14,500 cy | 1.50 | 3.00 | 4.00 |
| 9 | Embankment; levee | 1,700,000 cy | .15 | .20 | .25 |
| 10 | Embankment; esplanade | 200,000 cy | .16 | .30 | .55 |
| 11 | Dressing, seeding and mulching | 90 a | 83.00 | 300.00 | 600.00 |
| 12 | Rip rap | 21,500 cy | 5.70 | 12.00 | 6.00 |
| 13 | Stone protection; crushed or grav | 7,270 cy | 5.10 | 5.00 | 5.00 |
| 14 | Crushed stone; levee road | 2,150 cy | 4.35 | 4.00 | 10.00 |
| 15 | Pavement; macadam base | 11,560 sy | 1.00 | 1.70 | 3.00 |
| 16 | Pavement; bituminous macadam surf | 11,560 sy | 1.25 | 1.50 | 1.00 |
| 17 | Drill. 1.5 in. grout holes under mason | | | | |
| a | 1st stage | 6,000 lf | 2.75 | 2.50 | 6.00 |
| b | 2nd stage | 2,700 lf | 3.00 | 2.70 | 7.00 |
| c | 3rd stage | 1,000 lf | 3.50 | 3.00 | 10.00 |
| 18 | Pressure grouting under masonry | 1,000 sack cmt | 3.00 | 2.80 | 6.00 |
| 19 | Piling; round timber vertical | 21,100 lf | 1.40 | 1.25 | 2.00 |
| 20 | Piling; concrete | 760 lf | 6.00 | 7.00 | 8.00 |
| 21 | Piling; steel sheet, type MA 22 | 2,400 sf | 2.35 | 2.00 | 2.50 |
| 22a | Timber—hardwood | 2.41 Mf bm | 300.00 | 500.00 | 900.00 |
| b | softwood | 3.93 Mf bm | 225.00 | 300.00 | 300.00 |
| c | cribbing | 187.0 Mf bm | 200.00 | 200.00 | 250.00 |
| 23 | Concrete | | | | |
| a | Cl. "A" (Crse. agg. furn. by contr.) | 6,550 cy | 44.15 | No Bid | 80.00 |
| b | Cl. "B" (Crse. agg. furn. by contr | 385,600 cy | 19.30 | No bid | 14.65 |
| c | Slushing (Crse. agg. furn. by contr | 50 cy | 50.00 | No bid | 40.00 |
| 24 | Cement | 445,000 bbl | 3.20 | 2.50 | 2.40 |
| 25 | Absorptive form lining | 620,500 sf | .19 | .30 | .30 |
| 26a | Steel—conc. reinf | 2,935,000 lb | .10 | .083 | .14 |
| b | structural, wall armoring | 717,800 lb | .12 | .105 | .25 |
| c | semi c.r., miscellaneous | 125,400 lb | .28 | .18 | .30 |
| d | structural, miscellaneous | 858,700 lb | .25 | .21 | .35 |
| e | corrosion resisting | 13,950 lb | 1.10 | .92 | 1.50 |
| 27a | Cast., ir. and steel (All cl. ex. spec.) | 291,000 lb | .424 | .25 | .40 |
| b | special cast iron | 102,000 lb | .15 | .20 | .30 |
| 28 | Water stops, copper | 13,700 lb | 1.10 | 1.00 | 1.60 |
| 29 | Miscellaneous non-ferrous metal | 8,000 lb | .30 | 1.00 | .75 |
| 30 | Pipe; black steel, grouting (3") | 8,200 lf | 1.91 | .70 | 2.60 |
| 31 | Pipe; cast iron, flanged, 6" | 100 lf | 11.21 | 4.00 | 8.09 |
| 32a | Pipe; cast iron, threaded 1.5" dia | 65 lf | 4.45 | 1.00 | 1.90 |
| b | 2" dia | 395 lf | 3.90 | 1.20 | 2.20 |
| c | 2½" dia | 130 lf | 3.28 | 1.40 | 4.00 |
| d | 3" dia | 409 lf | 6.00 | 2.00 | 5.00 |
| e | 4" dia | 320 lf | 7.80 | 2.25 | 7.90 |
| 33a | Pipe; cast iron, water—3" dia | 530 lf | 2.36 | 2.00 | 5.00 |
| b | 4" dia | 3,200 lf | 2.62 | 1.40 | 7.20 |
| 34a | Pipe; cast iron, soil—4" dia | 102 lf | 3.48 | 2.00 | 4.30 |
| b | 5" dia | 5 lf | 4.82 | 2.00 | 6.00 |
| c | 6" dia | 28 lf | 6.60 | 2.50 | 7.80 |
| d | 8" dia | 45 lf | 10.00 | 4.00 | 14.50 |
| 35a | Pipe; std. steel, galvanized—½" dia | 3,675 lf | .65 | .60 | .50 |
| b | ¾" dia | 24 lf | 2.75 | 1.00 | .60 |
| c | 1" dia | 1,084 lf | .80 | 1.00 | .90 |
| d | 1¼" dia | 340 lf | .93 | 1.00 | 1.00 |
| e | 1½" dia | 6,572 lf | .80 | .75 | 1.30 |
| f | 2" dia | 1,102 lf | 2.30 | 1.00 | 1.70 |
| g | 3" dia | 4,907 lf | 1.64 | 2.00 | 3.50 |
| h | 4" dia | 3 lf | 37.00 | 3.00 | 6.00 |
| 36a | Pipe; std. steel, black—2" dia | 1.5 lf | 1.07 | 2.00 | 1.50 |
| b | 2½" dia | 26 lf | 1.69 | 2.00 | 2.00 |
| c | 3" dia | 3 lf | 2.21 | 2.00 | 2.60 |
| d | 4" dia | 65 lf | 9.00 | 2.00 | 4.00 |
| e | 6" dia | 2,112 lf | 5.56 | 3.00 | 6.50 |
| f | 8" dia | 35 lf | 11.40 | 6.00 | 9.00 |
| g | 10" dia | 70 lf | 12.60 | 7.00 | 14.00 |
| 37a | Pipe; w. i., galv.—¾" dia | 81 lf | 1.55 | 1.00 | 1.20 |
| b | 1" dia | 222 lf | 1.60 | 1.00 | 1.50 |
| c | 1½" dia | 41 lf | 2.75 | 1.00 | 2.60 |
| d | 2" dia | 60 lf | 4.40 | 1.20 | 3.50 |
| 38a | Pipe; w. i., black ¾" dia | 60 lf | .38 | 1.00 | .90 |
| b | 1½" dia | 42 lf | .93 | 1.00 | 2.00 |
| c | 3" dia | 112 lf | 2.59 | 2.00 | 6.00 |
| 39 | Pipe; ex. hy. brass, ½" dia | 935 lf | 1.85 | 1.20 | 5.00 |
| 40a | Pipe; vitrified clay, std.—4" dia | 328 lf | 1.10 | 1.00 | 1.00 |
| b | 5" dia | 191 lf | 1.23 | 1.00 | 1.25 |
| c | 6" dia | 781 lf | 1.35 | 1.00 | 1.35 |
| d | 8" dia | 10 lf | 2.00 | 1.20 | 2.00 |
| e | 10" dia | 120 lf | 2.75 | 1.50 | 3.00 |
| 41 | Pipe; farm tile, 6" dia | 773 lf | .75 | 1.00 | 1.00 |
| 42 | Pipe; corrugated, galv., 48" dia | 635 lf | 22.00 | 15.00 | 30.00 |
| 43 | Inlet, float well supply | 4 ea | 20.00 | 70.00 | 260.00 |
| 44 | Inlet A | 20 ea | 75.00 | 50.00 | 50.00 |
| 45 | Inlet B | 33 lf | 25.00 | 15.00 | 15.00 |
| 46 | Piezometer system, complete | lump sum | 653.00 | 1,000.00 | 1,500.00 |
| 47 | Piping; lock unwater. sys., compl | lump sum | 16,100.00 | 12,000.00 | 25,800.00 |
| 48 | Piping, sill flushing, compl. (36" dia | lump sum | 2,180.00 | 1,000.00 | 4,800.00 |
| 49a | Backwater valve, compl.—6" dia | 1 ea | 50.00 | 60.00 | 1,768.00 |
| b | 8" dia | 1 ea | 75.00 | 80.00 | 2,500.00 |
| 50 | Float well valve and equipment | lump sum | 812.00 | 2,500.00 | 3,200.00 |
| 51 | Sluice gate, lock unwater. and sill flushing, 36" dia | 4 ea | 1,800.00 | 2,000.00 | 2,000.00 |
| 52a | Diaphragms—48" corr. pipe | 14 ea | 195.00 | 400.00 | 200.00 |
| b | For 10" gas main | 3 ea | 100.00 | 300.00 | 130.00 |
| 53 | Drain. str., sluice gate; compl., 48" dia | lump sum | 6,580.00 | 40,000.00 | 6,000.00 |
| 54 | Drainage stop log structure, compl | lump sum | 910.00 | 2,000.00 | 3,000.00 |
| 55 | Sprinkler heads; lawn | 329 ea | 2.60 | 3.00 | 2.00 |
| 56 | Rack; fire hose | 6 ea | 157.00 | 100.00 | 150.00 |
| 57a | Floor grating—steel | 504 sf | 4.00 | 3.00 | 6.00 |
| b | aluminum | 186 sf | 5.50 | 5.50 | 12.00 |
| 58a | Floor plate—steel | 2,500 sf | 2.30 | 2.50 | 4.00 |
| b | abrasive | 2,152 lb | .45 | .375 | .60 |
| 59 | Tile gage | 282 lf | 12.00 | 25.00 | 30.00 |
| 60 | Handrailing | 70,000 lb | .50 | .36 | .75 |
| 61 | Guard post | 88 ea | 5.00 | 12.00 | 12.00 |
| 62 | Guard rail | 3,675 lf | 1.60 | 2.00 | 1.80 |
| 63 | Fence, complete | 444 lf | 1.70 | 3.00 | 3.50 |
| 64 | Curb and gutter | 1,137 lf | 3.00 | 1.00 | 5.00 |
| 65 | Wooden gallery door | 11 ea | 70.00 | 200.00 | 90.00 |
| 66 | Door; transformer vault, complete | lump sum | 150.00 | 250.00 | 350.00 |
| 67 | Culvert valve pit cover, complete | 7 ea | 1,400.00 | 2,000.00 | 8,900.00 |
| 68a | Miter gate (two leaves)—main lock | lump sum | 211,000.00 | 205,874.00 | 230,000.00 |
| b | auxiliary lock | lump sum | 153,000.00 | 152,000.00 | 165,000.00 |
| 69a | Lift gate—upst. leaf (excl. react. rollers) | 2 ea | 101,000.00 | 116,000.00 | 125,000.00 |
| b | Downstream leaf (excl. react. rollers) | 2 ea | 145,000.00 | 167,000.00 | 180,000.00 |
| 70 | Culvert tainter valve; compl. | 7 ea | 9,400.00 | 9,900.00 | 11,000.00 |
| 71 | Lock bulkhead unit | 16 ea | 18,600.00 | 19,000.00 | 20,000.00 |
| 72 | Culvert bulkhead | 7 ea | 3,300.00 | 4,500.00 | 5,000.00 |
| 73a | Relief valve cable—mark 30/22-10 | 4 ea | 35.00 | 100.00 | 120.00 |
| b | mark 30/22-11 | 2 ea | 20.00 | 80.00 | 96.00 |
| 74a | Floating mooring bitt—drum | 27 ea | 1,050.00 | 1,300.00 | 2,025.00 |
| b | reaction roller assembly | 27 ea | 726.00 | 600.00 | 910.00 |
| 75 | Walkway bridge, complete | 2 ea | 9,900.00 | 12,900.00 | 15,750.00 |
| 76 | High water dam | lump sum | 13,200.00 | 13,900.00 | 16,800.00 |
| 77 | Culvert bulkhead recess cover | lump sum | 500.00 | 1,000.00 | 125.00 |
| 78a | Lift gate mach., compl. downstream leaf | 4 ea | 42,250.00 | 34,000.00 | 60,000.00 |
| b | upstream leaf | 4 ea | 42,100.00 | 34,000.00 | 60,000.00 |
| 79a | Miter gate mach.; Compl. E. and interm. walls | 3 ea | 40,400.00 | 35,500.00 | 55,000.00 |
| b | west wall | 1 ea | 39,100.00 | 35,500.00 | 54,000.00 |
| 80 | Walkway bridge machine | 4 ea | 8,000.00 | 8,100.00 | 13,000.00 |
| 81a | Culv. tainter valve mach., compl.—E. and interm. walls | 5 ea | 20,400.00 | 15,700.00 | 22,500.00 |
| b | west wall | 2 ea | 20,000.00 | 15,700.00 | 22,500.00 |
| 82 | Lift gate reaction rollers, compl | 24 ea | 2,700.00 | 2,600.00 | 4,100.00 |
| 83a | Spare parts—miter gate mach | lump sum | 10,800.00 | 6,500.00 | 12,500.00 |
| b | lift gate mach | lump sum | 8,500.00 | 4,800.00 | 16,000.00 |
| c | tainter valve mach | lump sum | 1,590.00 | 1,000.00 | 35,000.00 |
| d | walkway bridge mach | lump sum | 2,280.00 | 1,400.00 | 4,500.00 |
| e | reaction rollers | lump sum | 2,240.00 | 3,000.00 | 4,000.00 |
| 84 | Stiffleg derrick | 2 ea | 12,400.00 | 35,000.00 | 84,000.00 |
| 85 | Hoist, and operating equip | 2 ea | 14,600.00 | 17,000.00 | 41,000.00 |
| 86 | Lock bulkhead; pickup | lump sum | 12,900.00 | 20,800.00 | 25,600.00 |
| 87 | Culv. bulkhead hand. equip. | lump sum | 6,160.00 | 4,500.00 | 7,200.00 |
| 88 | Culv. bulkhead; pickup | lump sum | 510.00 | 1,590.00 | 1,950.00 |
| 89 | Nappe pickup strongback | lump sum | 650.00 | 1,870.00 | 2,250.00 |
| 90a | Counterweights, compl. upstream leaf | 4 ea | 5,400.00 | 4,300.00 | 5,100.00 |
| b | downstream leaf | 4 ea | 10,000.00 | 6,600.00 | 7,550.00 |
| 91a | Pumps, compl.—lock unwatering | 2 ea | 7,420.00 | 9,000.00 | 8,500.00 |
| b | fire | 1 ea | 2,810.00 | 3,000.00 | 4,260.00 |
| c | crossover | 7 ea | 1,440.00 | 1,400.00 | 2,345.00 |
| d | culvert valve unwatering | 1 ea | 1,490.00 | 1,500.00 | 7,400.00 |
| 92 | Lock conduit sys | lump sum | 29,500.00 | 50,000.00 | 60,300.00 |
| 93 | Electrical grounding sys | lump sum | 7,000.00 | 2,000.00 | 13,200.00 |
| 94 | Incoming power line | lump sum | 6,000.00 | 10,000.00 | 6,700.00 |
| 95 | Esplanade conduit sys | lump sum | 29,600.00 | 20,000.00 | 18,700.00 |
| 96 | Air compressor; compl | lump sum | 1,840.00 | 2,500.00 | 3,720.00 |
| 97 | Fuel oil supply system | lump sum | 2,070.00 | 1,500.00 | 3,310.00 |
| 98 | Gasoline supply system | lump sum | 912.00 | 1,000.00 | 1,943.00 |
| 99 | Lift truck and platforms | lump sum | 762.00 | 880.00 | 1,000.00 |
| 100 | Hoist; rachet type | 3 ea | 103.00 | 80.00 | 100.00 |
| 101 | Chain hoist | lump sum | 340.00 | 500.00 | 300.00 |
| 102a | Jacks—hydraulic jacks | lump sum | 209.00 | 60.00 | 400.00 |
| b | push and pull | lump sum | 121.00 | 100.00 | 125.00 |
| 103 | Miscellaneous plumbing | lump sum | 1,650.00 | 1,000.00 | 2,120.00 |
| 104 | Permanent buildings, complete | lump sum | 245,300.00 | 211,000.00 | 137,400.00 |
| 105 | Temporary buildings | lump sum | 26,400.00 | 25,000.00 | 30,000.00 |
| | Alternate | | | | |
| 23 | Concrete | | | | |
| a | Class "A" (Coarse Aggregate furnished by Government) | 6,550 cy | 42.20 | 35.00 | 77.25 |
| b | Class "B" (Coarse Aggregate furnished by Government) | 385,600 cy | 17.35 | 17.80 | 12.70 |
| c | Slushing (Coarse Aggregate furnished by Government) | 50 cy | 48.00 | 50.00 | 39.00 |

Plus cost of Aggregate furnished by Government.

# BYERS WROUGHT IRON PIPE

## In this trench warfare fights against corrosion

This new underground line connects two wells serving the boiler house at an industrial plant. Hazards to pipe life are particularly severe, as the soil contains cinder fill. The engineers looked for a material with extra corrosion resistance . . . and selected wrought iron. As an added precaution, the pipe was coated and wrapped before installation.

Even with ordinary soils, highly aggressive corrosive attack is frequently encountered, and only the use of the right material can forestall early and extensive repairs and replacements. Wrought iron has been used for so many years, in locations all over the country, that its superior resistance is a matter of engineering record, and recommends it for first consideration. For instance:

. . . a water main made of ordinary material with $\frac{5}{8}$" wall developed 25 leaks within 2,000 feet of length in 42 years. A parallel wrought iron line with $\frac{3}{8}$" wall developed *no* leaks in 61 years.

. . . a 50" wrought iron water main is still operating under 135-lbs. pressure after 60 years service. Only one leak has ever been reported.

. . . In a mid-west community, wrought iron lines were reported as still serving after 43 years. Ordinary materials had lasted only 14 years in the same areas.

Examples could be continued almost indefinitely . . . but these will illustrate the splendid performance of wrought iron.

The reason for wrought iron's corrosion resistance is found in its unique structure. Tiny fibers of glass-like silicate slag, threaded through the body of high-purity iron, halt and "detour" corrosive attack, and so discourage pitting and penetration. The fibers also help to anchor the initial protective scale that shields the underlying metal.

If you have any underground lines in prospect, you will find some helpful information in our bulletin, "Wrought Iron for Underground Services." Ask for a copy.

A. M. Byers Co., Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, Salt Lake City, Seattle, San Francisco. Export Division: New York, N.Y.

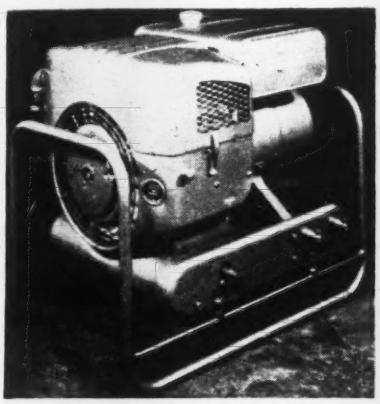
CORROSION COSTS YOU MORE THAN WROUGHT IRON

**BYERS**
**GENUINE WROUGHT IRON**
**TUBULAR AND HOT ROLLED PRODUCTS**
ELECTRIC FURNACE QUALITY ALLOY AND STAINLESS STEEL PRODUCTS

# New Aids to the Constructor

MANUFACTURERS' LATEST DEVELOPMENTS IN EQUIPMENT AND MATERIALS

*FLOOR TILE*—A laminated and decorative plastic floor tile with excellent sound absorption qualities has been trade-named Plastile. It is made from genuine vinyl compound and is a true plastic. It will be available in a wide range of colors in standard tile sizes of 8½x8½ and 9x9 in. and in sheets 35x35 in. It is not affected by acids, alkalies, oils, grease, abrasion and any type cleaning fluids.—*U. S. Stoneware Co., Akron, Ohio.*



*GAS-DRIVE DC WELDER*—A new portable gas-driven "DC" arc welder weighs 315 lb. and is of compact construction. The "Sureweld" is portable on as well as to the job. The welder, 32 in. long, 26 in. wide, and standing 28 in. high (without wheels), fits easily into the back of a "Jeep," station wagon, or even the trunk compartment of some cars, and can be lifted by two men. The generator is a four-pole, self excited type with interpoles. The welder is rated at 150 amp. at 30 v. on 50 percent duty cycle. It has a four-cycle, two cylinder, opposed design engine. Electrodes up to 5/32 in. and certain types of 3/16 in. may be used with the welder.—*Hollup Corp., Division of National Cylinder Gas Co.*, 205 *West Wacker Drive, Chicago, Ill.*

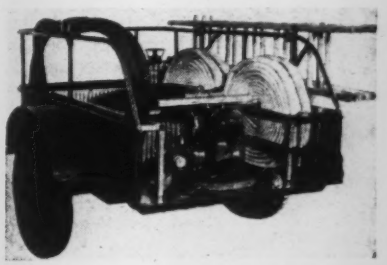
*STEEL BASEMENT WINDOW* — A steel basement window of improved design known as the Kewanee Master window will accommodate putty or puttyless glazing and is built in three sizes, two-light. Extremely tight-fitting construction with positive latch is claimed. The window cannot be opened from the outside. Screens and storm sash may be quickly inserted or removed, by means of spring plungers. Its outstanding feature is the friction supporting arm construction which allows this window to be opened to any degree of ventilation desired.—*Kewanee Manufacturing Co., Kewanee, Ill.*

*ALUMINUM PAINT* — Made with Prufcoat's famous, corrosion-proof, synthetic resin vehicle and a special aluminum powder that leafs remarkably well, Prufcoat aluminum offers many advantages not obtainable with ordinary aluminum paint. It is said to stay brighter longer and to provide double-action protection. It comes ready-mixed and air-dries in a matter of minutes. — *Prufcoat Laboratories, Inc., 63 Main St., Cambridge, Mass.*

*SASH BALANCE-WEATHERSTRIP*—The Milwaukee combination sash balance-weatherstrip consists of spring bronze channel side strips, in conjunction with cadmium-coated steel springs, to replace the old type system of cords-weights-and-pulleys. The channel side strips act as vertical weatherstripping and, when used in conjunction with ordinary horizontal cross members of zinc, result in a complete weatherstripping job.—*Milwaukee Metal Strip Service, Inc., Milwaukee, Wis.*

*EARTH RESISTIVITY APPARATUS*—The Gish-Rooney earth resistivity apparatus, by means of measurements made at the surface of the earth, gives information concerning geological conditions below prior to drilling or excavating. It finds use in ground water prospecting and civil engineering subsurface investigations. It locates and measures depth to bedrock; locates faults and other geological features, water-bearing layers and gravel deposits. The apparatus embodies the necessary measuring instruments including a precision potentiometer.—*Geophysical Instrument Co., Arlington, Va.*

*WOOD PRESERVATIVE* — "Penta," pentachlorphenol, preservative for treating lumber, leaves it looking like untreated material. The wood is practically odorless, is clean to handle and takes paint perfectly, yet safe from destruction by termites, beetles or decay. Pentachlorphenol is virtually insoluble in water, hence does not leach out. — *Chapman Chemical Co.*, 333 *North Michigan Ave., Chicago* 1, *Ill.*



*PORTABLE FIRE FIGHTER*—Compactly mounted on a sturdy two-wheeled trailer, the Porto-Pumper consists basically of the Porto-Pump, a gasoline-driven high pressure utility pump; 75 ft. of supply hose and 250 ft. of fire hose; an 18 ft. 3-section extension ladder; fire axe and hand type extinguisher. It can be easily attached to automobile, jeep, or truck—*Porto Pump, Inc., 227 Iron St., Detroit, Mich.*

*RESIN SURFACE COATING*—New thermosetting plastic surface coating is particularly well adapted to coating ceramics, concrete and similar porous bodies. Designated as "Jet-Kote", it is manufactured from new group of plastics obtained from furane derivatives. It does not contain oils or resin modifiers. Heavy deposit may be laid in one brush coat, tending to hide surface defects, scars, and scratches on relatively porous materials. — *Furane Plastics and Chemicals Co.*, 4500 *Brazil St., Los Angeles* 26, *Calif.*

*PLYWOOD PANEL* — Vertical grain cedar is being specially cut to produce entirely new straight grain plywood panel. Its light color lends itself to variety of finishes. When desired, the new weldwood can be made to look like

# "VIC" VICTAULIC SAYS...

***"Our Couplings Save Money for Others ...Why Not for You?"***

"Just a couple of twists with *any* type of wrench ... and the two bolts on Victaulic Couplings are buttoned up! That's the 'two-bolt' simplicity that saves you *time and money* in assembly ... repair ... salvage!

"Then too, Victaulic Couplings give your piping systems a *flexibility* that lets the line follow building and ground contours *without the expense of rigid alignment!*

"What's more, when you use Victaulic Couplings your piping systems have a *union at every joint* ... with a slip-proof lock that can't blow off or pull out under pressure, vibration or sag ... and contraction-expansion is taken care of *automatically!*

"Now, to wind up this economy-picture, take a look at Victaulic FITTINGS. Their long and easy sweeps have been engineered for FULL-FLOW service ... internal friction is reduced to a minimum. You get increased delivery at lower pumping costs ... with VICTAULIC FULL-FLOW FITTINGS!

"Yes sir! For the extra economy of *full* efficiency and *complete* dependability ... make your next piping system ALL Victaulic!"

*Write for new Victaulic Catalog and Engineering Manual*

**VICTAULIC COMPANY OF AMERICA**

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*For export outside U. S. and Canada: PIPECO Couplings and Fittings:*
*Pipe Couplings, Inc., 30 Rockefeller Plaza, New York 20, N. Y.*

**Have you considered Victaulic for your piping requirements?**

Sizes—¾" through 60"

SELF-ALIGNING PIPE COUPLINGS

**VICTAULIC**

EFFICIENT FULL-FLOW FITTINGS

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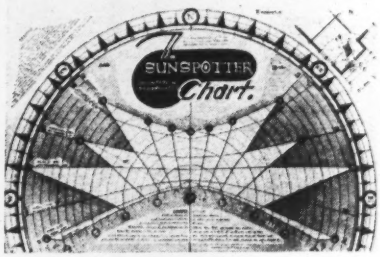
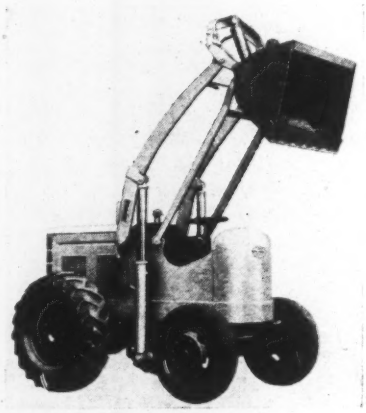
combed grain oak. To gain maximum production, only ¼-in., 4 x 8-ft. panels are available at present.—*United States Plywood Corp., Weldwood Bldg., 55 W. 44th St., New York* 18, *N. Y.*

*CAST IRON ELECTRODE*—Nicast is new P&H electrode reported by manufacturer to put cast iron in class with steel for ease of welding and finishing. Made for use with either a.c. or d.c. current, it is available in ⅛-in. and 5/32 x 14-in. sizes.—*Harnischfeger Corp., Milwaukee* 14, *Wis.*




*ORIENTATION PLANNING CHART*—Literally harnessing the sun, Briggs' Sunspotter Chart, a two-dimensional plan on an 11 x 17-in. board, enables a building designer to determine how much sun a room will get during any daylight hour of any of the year's 365 days. It interprets at once the sun's angle from east to west plus the depth to which the sun's rays will penetrate an interior. Its use by architects will make possible good orientation of even the simplest home with a minimum of effort.—*William Briggs, Redding, Conn.*



*TRACTOR LOADER*—The Model HF ¾ yard shovel has many innovations and exclusive features. A unique 4-speed fully reversible transmission provides practical forward digging speeds plus high reverse maneuvering speeds. A single lever shifts gears into the desired speed range. The bucket is raised, lowered, dumped and relatched by hydraulic power, controlled by a single lever. Bucket may be dumped com-

# this grocer's floor had become a skating rink

## ...BUT EMPLOYERS MUTUALS SAFETY ENGINEERING MADE IT SAFE AGAIN

Pride of a super grocery was its beautiful tile floor. But through years of cleaning, a greasy substance had accumulated in the joints—and more and more customers slipped and complained.

It became a question of solving the problem or installing a new floor. Many attempts at a solution had failed. Employers Mutuals safety engineers suggested a raised abrasive strip in the joints of the tiles. The result: the floor was saved, the slipping was stopped, the customers' complaints ceased.

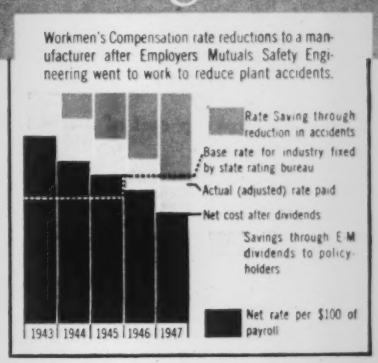
* * *

It is in such cases that the real spirit of Employers Mutuals as a service organization, rather than just an insurance selling organization, becomes vital to you. For Employers Mutuals provide specially trained people skilled in safety work—in accident and fire prevention, industrial safety and health education programs—in prompt claim payment, and in other services.

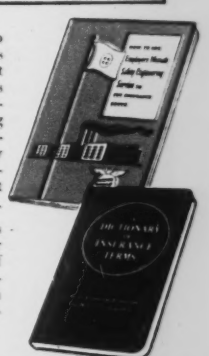
Employers Mutuals are mutual companies, organized, operated and managed for the welfare of its owners—the policyholders. Therefore they furnish all services that help to reduce your insurance costs and at the same time pay back to you—its owners—all savings beyond ample legal reserves, in the form of dividends. All policies are nonassessable.

* * *

It is the way—the human way—in which Employers Mutuals company-trained men analyze your casualty and liability insurance problems, write your policies, study your operations, and pay your claims, that result in lower insurance costs and return to you part of the premium you have paid.


Workmen's Compensation rate reductions to a manufacturer after Employers Mutuals Safety Engineering went to work to reduce plant accidents.
Rate Saving through reduction in accidents
Base rate for industry fixed by state rating bureau
Actual (adjusted) rate paid
Net cost after dividends
Savings through E-M dividends to policyholders
Net rate per $100 of payroll
1943
1944
1945
1946
1947

A new booklet, "How to Use Employers Mutuals Safety Engineering to Cut Insurance Costs," explains this vital service and its importance to you in reducing your insurance and operating costs. Get a copy from the Employers Mutuals man. Or write direct to the home office for it.



Write on your business letterhead, and ask also for a copy of "A Dictionary of Insurance Terms," a copyrighted book which you can secure only from Employers Mutuals of Wausau.

EMPLOYERS MUTUALS OF WAUSAU ... make insurance understandable

**EMPLOYERS MUTUALS OF WAUSAU**

EMPLOYERS MUTUAL LIABILITY INSURANCE COMPANY OF WISCONSIN
EMPLOYERS MUTUAL FIRE INSURANCE COMPANY
HOME OFFICE: WAUSAU, WISCONSIN
*Offices in Principal Cities—Consult Your Telephone Directory*

GET YOUR AIR COSTS DOWN TO JAEGER FIGURES

AIR PLUS JAEGER COMPRESSOR

**1.** More air, and cooler, drier air per pound of fuel — a direct, day-to-day cost saving.

**2.** Full power behind your tools — no waiting — more work done per dollar of wages.

**3.** Lowest upkeep cost of any compressor you have ever owned.

Efficient mass production in our new compressor plant makes possible machines of this quality at bedrock prices. See your Jaeger distributor or write us for Catalog.

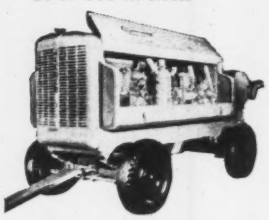
75% to 100% larger "ultra lapped" valves,

20% to 30% slower piston speed,

100% efficient intercooling; force feed lubrication.

50% larger air receivers,

60 to 600 ft. sizes.



**THE JAEGER MACHINE CO.**

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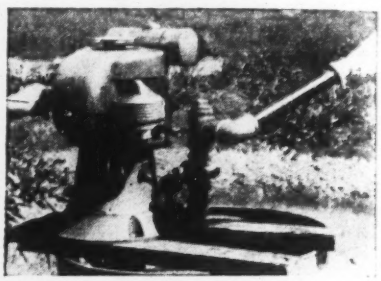
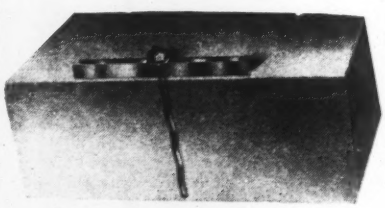
pletely or gradually at any height. Full bucket capacity is assured and spillage of loose materials prevented by means of the automatic bucket tip-back. A bulldozer blade, crane hook, cab and snow bucket are also available.—*The Frank G. Hough Co., Libertyville, Ill.*



*GASOLINE ENGINE DRIVEN PUMP*—Lightweight portable self-priming contractors type pump with capacity of more than 6,000 gal. per hour will soon be available. Vertical shaft arrangement of engine provides compact design. Pump has only one moving part—cast bronze impeller with stainless steel shaft, which is directly coupled to engine crankshaft. Engine is two-cycle type of advanced design.—*Diesel Pump & Electric Mfg. Co., 110 W. Broadway, Glendale, Calif.*



*FORM ALIGNER* — A new device aligns the bottom of steel or wood forms. The anchor may be set at any point near the center of the footing at intervals of 3 or 4 ft. The parallel gage bars can be placed any time prior to the setting of the forms, and adjusted to a chalk line for spacing of forms. It also provides some anchorage of the wall to the footing. The forms are inexpensive and simple to install. —*Williams Form Engineering Corp., Box 925, Madison Square Station, Grand Rapids 7, Mich.*

*ADJUSTABLE SAW TRACK*—Structural steel welded track, readily adjustable for use with Stanley safety saws W7, W8 and W9 for square, bevel or bevel mitre cuts, eliminates laying out and marking each piece of lumber. It can also be used for cutting slate, marble, etc., when proper abrasive wheel is used. Shipping weight is 13 lbs., overall length—37 in.—*Stanley Electric Tools, New Britain, Conn.*

# Mt. Vernon Comes Out on Top in Wear and Protection

**It takes stamina and durability** in a duck to come back again and again for more weather buffeting and man-handling on the job.

And for the punishing jobs where tarpaulins have to take it and like it, Mt. Vernon Extra duck is the first choice. For it is made of top grades of cotton, spun and woven to a high degree of uniformity that gives it the strength and quality needed for a long life and a rough life. For canvas that gives you the "top" in wear and weather protection, specify Mt. Vernon Extra.

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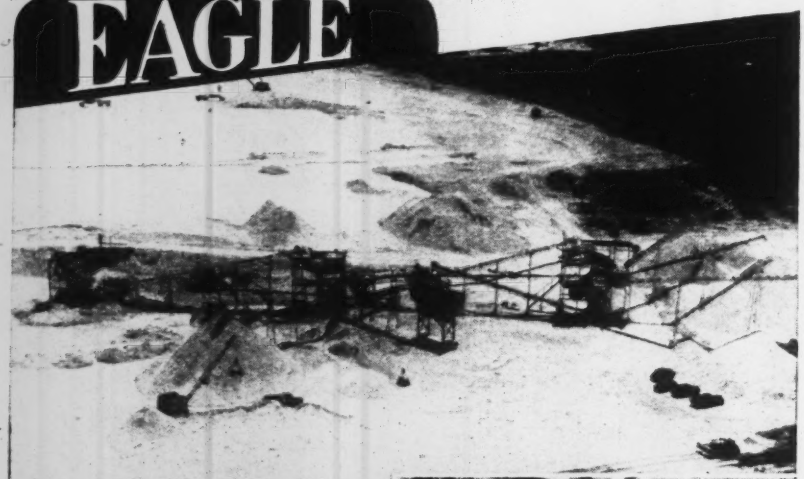
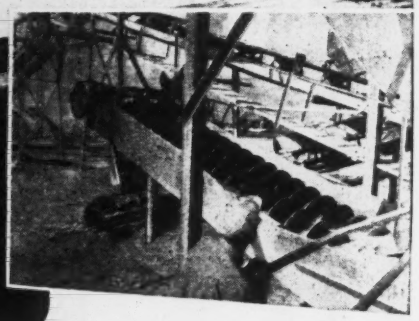
# EAGLE



## SCREW WASHER PROVIDES CLEAN CRUSHED STONE AT MIAMI



Pictured is the modern day plant of Miami Crushed Stone Co., which was put in operation in 1946 on a 380 acre tract of oolitic limerock near Miami, Florida. The output of this plant is commonly 30 to 35 carloads of aggregates daily.

As the most advanced equipment is installed at this plant, there is naturally an Eagle Washer-Classifier-Dewaterer present—as shown above. This 24 inch by 20 foot Eagle Double Screw Washer removes all lime dust and silt from the crushed material.

As in numerous other localities, the Eagle unit helps to assure the Miami area properly washed and above-specification material for better roads, better concrete, better foundations and better airports.

Operating characteristics of Eagle Screw and Log Washers include: more thorough washing; controlled, concentrated water volume; high continuous capacity; longer screw life; no dead zones in tank; lower power requirements; and a better product at lower cost.

Write for Bulletin No. 46 on Eagle Sand, Gravel and Ore Equipment.

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LOG WASHERS — DEHYDRATORS — SAND TANKS
CLASSIFIERS — REVOLVING SCREENS

**EAGLE IRON WORKS**

**142 Holcomb Ave. • Des Moines, Iowa**


## Men and Jobs

**Angus E. Slee** has accepted a full-time position as city engineer for Longmont, Colo. Formerly Mr. Slee was a member of the firm of Runyan & Slee, consulting engineers.

The Oklahoma State Highway Department announced the following appointments: **George L. Johnson,** Oklahoma City, as chief engineer of the department's farm-to-market road construction program to succeed Roy B. Parker, resigned, and R. B. Winfrey, Little Rock, Ark., as state maintenance engineer.

**Charles N. Bennett,** Portland, Ore. civil engineer, has been appointed production manager of H.M.K. Builders Co., Portland, producer of trusses and panelized buildings. He was formerly associated with Timber Structures, Inc., in an engineering capacity.

**Frank E. Carroll,** structural engineer, has joined the engineering department of the Timber Engineering Co. Mr. Carroll, who was graduated recently from the Massachusetts Institute of Technology, served for 3½ years in the U. S. Army's 15th Engineer Combat Battalion, 9th Division.

**John E. Buxton** has opened a temporary office in Little Rock, Ark., to practice civil and industrial engineering. From 1937 to 1941 Mr. Buxton was in the general engineering and contracting business and from 1941 to 1946 he served with the U. S. Corps of Engineers, from which he was separated with the rank of lieutenant colonel.

**Bert W. Boyson,** of Raymond, Alberta, Canada, has been appointed irrigation engineer for the Department of Agriculture, Regina, Sask. A graduate in civil engineering from Utah State College, Mr. Boyson is a specialist in irrigation and drainage engineering.

**Robert M. Pennock,** chief structural engineer in the Buffalo Division of Buildings, has resigned to re-enter private practice as an engineer. Since entering the city's employ in 1912, he has passed on many million dollars-worth of construction in Buffalo.

**Col. Harry E. Blakely,** formerly of the American Road Builders Association, has become executive secretary of the Mississippi Highway Contractors' Association at Jackson, Miss. Colonel Blakely is a civil engineer graduate of Georgia Tech. 1928. He taught civil

# FWD Trucks Provide Fast, Safe, Sure Transport of Heavy Machinery or Material...On or Off the Road

Hauling power shovels and other heavy machinery, huge loads of cement, bulky loads weighing 50 tons or more — those heavy-duty hauling jobs are usually entrusted to FWD four-wheel-drive trucks.

The safety and surety — the reliable pulling power of four or six driving wheels — the ability to move the load to location on or off the highway — these FWD advantages count heavily in this and other heavy-duty trucking operations.

Wherever motor truck performance must be more than usually dependable—in heavy hauling, in highway or municipal service, in utility line construction and maintenance, in oil-field operations — FWD four-wheel and six-wheel-drive trucks are rendering important service.

**THE FOUR WHEEL DRIVE AUTO COMPANY**
CLINTONVILLE, WISCONSIN
*Canadian Factory:* KITCHENER, ONTARIO

*America's Foremost* **FWD** *Heavy-Duty Truck*

## Worthington-Ransome Blue Brute Distributors

See ad on page 127 for list of equipment in each line

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Iowa, Cedar Rapids, McNall Mach. & Supply Corp.
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Kansas, Topeka, M. B. Salisbury Co.
Ky., Harlan, Croushorn Equip. & Supply Co.
Louisville, Williams Tractor Co.
Detroit, W. H. Anderson Co., Inc.

Mich., Muskegon, Lakeshore Machy. & Supply Co.
Minn., Minneapolis, Phillippi Murphy Equip. Co.
Mass., Cambridge, Field Machy. Co.
Mass., West Springfield, E. F. Edson Co. Inc.
Miss., Jackson, Jackson Road Equip. Co.
Mo., Clayton, The Howard Corporation
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St. Louis, W. H. Reaves
Montana, Billings, Interstate Truck & Equip. Co.
Helena, Caird Eng. Works

Nevada, Elko, C. W. Paul Hardware and Machy. Co.
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N. M., Albuquerque, Bud Fisher Co.
Boswell, Smith Machy. Co.
N. Y., Albany, Milton-Hale Machinery Co.
New York, Hodge & Hammond, Inc.
New York, Railroad Materials Corp.
Syracuse, Milton-Hale Mach. Co.
N. C., High Point, Smith Equip. Co.
N. D., Fargo, Smith Commercial Body Works, Inc.

Ohio, Cincinnati, Carroll-Edwards & Co.
Dayton, Carroll-Edwards & Co.
Toledo, The Kilcorse Machy. Co.
Okla., Oklahoma City, Tattan-Douglass Equip. Co.
Oregon, Portland, Andrews Machinery

Pa., Wilkes-Barre, Ensminger & Co.
Mechanisburg, American Equip. Corp.
Philadelphia, Metalweld, Inc.

S. C., Columbia, Smith Equipment Co.

Tenn., Knoxville, Dempster Bros., Inc.
Memphis, Independent Tractor Co.
Nashville, Dempster Bros., Inc.
Tex., Amarillo, T. W. Carpenter Equip. Co.
Dallas, Shaw Equip. Co.
Houston, So. Texas Equip. Co., Inc.
San Antonio, Patten Machy. Co.
Tyler, D. M. McClure Equip. Co.

Utah, Salt Lake City, J. K. Wheeler Mach. Co.

Va., Richmond, Highway Machy. and Supply Co.
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Md., Baltimore, Stuart M. Christhilf & Co.
Mich., Detroit, Welding Equip. & Supply Co.

N. Y., Buffalo, Murray Equip. Co.
N. Y., Rochester, B-G Equip. Co.
Pa., Pittsburgh, Arrow Supply Company.
O., Cleveland, H. B. Fuller Equip. Co.

**Worthington Distributors**

Ind., Indianapolis, Reid-Holcomb Company

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Md., Baltimore, D. C. Elphinstone, Inc.
Flint, Gransden-Hall & Co.

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New York, Air Compressor Rental and Sales

O., Cleveland, Gibson-Stewart Co.
Toledo, The Kilcorse Mach. Co.

Pa., Allentown, H. N. Crowder, Jr., Inc.
Pittsburgh, Atlas Equip. Corp.

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Wyoming, Cheyenne, Wilson Equip. & Supply Co.

*Buy Blue Brutes*

**Worthington Pump and Machinery Corp.**
**Worthington-Ransome Construction Equipment Division.**
**Holyoke, Massachusetts**


engineering at the University of Tennessee for four years and later worked for the Tennessee highway department. He spent six years in the Army, nearly five years in Iceland and on the continent of Europe.

**Thomas Gray,** general manager of Wartime Housing Ltd., since its formation in 1941 by the Canadian Department of Reconstruction and Supply, has retired to resume private work.

**George A. Drewett** has been appointed superintendent of construction for the Pacific Power & Light Co., with headquarters at Portland, Ore. He has been serving as division engineer at the company's Vancouver, Wash., office. He will supervise construction and maintenance on power transmission facilities. He succeeds **R. E. Forman,** who has been appointed superintendent of distribution. **A. O. Mangold** becomes division engineer, replacing Drewett at Vancouver.

**Wesley H. Stockley,** San Bernardino, Calif., civil engineer with the Santa Fe Railroad for the last 37 years, has retired at the age of 63.

**F. Stuart Chaplin, Jr.,** who has been connected with the department of regional studies, Tennessee Valley Authority, since Jan. 1, 1946, has been named permanent director of the new city planning department at Greensboro, N. C., succeeding **John A. Parker,** of Chapel Hill, N. C., who set up the department recently. He holds degrees in city planning from Massachusetts Institute of Technology.

**James M. Orman,** design division senior engineer in the Public Works Department at Dallas, Tex., has resigned to become city engineer at Bryan, Tex.

**Harry A. Turner, Jr.,** formerly acting Columbus, Ohio, traffic engineer, has been appointed on a full-time basis. He has been an engineer with the Hocking Valley Brick Co. for the last several months.

**Col. George W. Gillette,** South Atlantic Division Engineer of the U. S. Corps of Engineers, is retiring after more than 30 years of Army service. Twice he has served as district engineer at Wilmington, N. C., and it is reported that he will become manager of the North Carolina State Ports Authority. He received his engineering degree at North Carolina State College.

**George R. Rich,** who has been with Chas. T. Main, Inc., engineers, of Boston, Mass., has been made a member of the firm. Formerly he was chief design engineer of the Tennessee Valley Authority and previously had worked with Stone & Webster.

**Vernon W. Barlow,** civil engineer, has been appointed general sales manager of the Monarch Cement Co. of Humboldt, Kan. He has been assistant to the general sales manager of the Missouri Portland Cement Co., St. Louis, and previous to that was an engineer for the Portland Cement Association at Wichita, Kan.

**M. Block** has been appointed engineer of bridges for the Illinois Central Railroad, succeeding the late C. C. Westfall. Mr. Block joined the railroad in 1912 after having been graduated in civil engineering from the University of Colorado. In the first world war he was a sergeant in the 47th Engineers.

**Oliver J. Semmes, Jr.,** who served as city engineer of Pensacola, Fla., from 1932 until he entered the Army in 1942 and returned to that position after his discharge as a captain in the Army Engineer Corps in 1945, has been elected city manager of Pensacola.

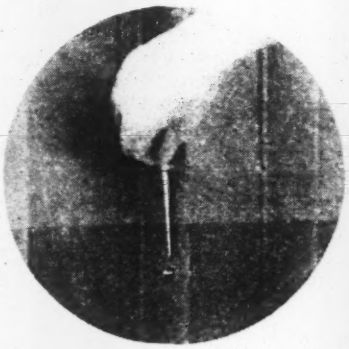
Gilbert Associates, Inc., Reading, Pa., specializing in municipal and industrial waste treatment have announced the addition of **William A. Yoder** and **Kenneth Thompson** to their sanitary engineering department. Yoder, a graduate of Penn State in 1940, spent 4½ years in the Navy as engineering officer on a minesweeper and executive officer of a Navy Construction Battalian. He was formerly with Wertz Engineering Co., Reading, Pa., engaged in the design of industrial waste treatment plants for textile, milk plant and laundry wastes. Thompson, also a graduate of Penn State, finished in 1944. He spent two years in the Army on petroleum control, before joining Wiggert and Dean Engineering Co., Daytona Beach, Fla. With Wiggert and Dean, Thompson was engaged in the design of municipal water and sewage treatment plants.

**Max Phillips** has been appointed Huron County sanitary engineer at Norwalk, Ohio, replacing **Thomas Gabele,** who resigned to teach in New Mexico.

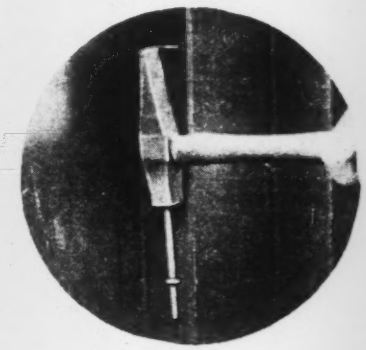
**Edward B. Rice** who served as U. S. geologist in Alabama, Mississippi and Louisiana, has been appointed engineer with the North Carolina District of the U. S. Geological Survey work, with headquarters in Raleigh. He succeeds **Edmund D. Burchard,** resigned.

# AVERAGE LENGTH TIE ROD

## A HAMMER *is the* ONLY *Tool you need to erect* BULLDOG FORMS



Square cut nail secures Tie



Hammer is the only tool used

Form is now spaced and held secure

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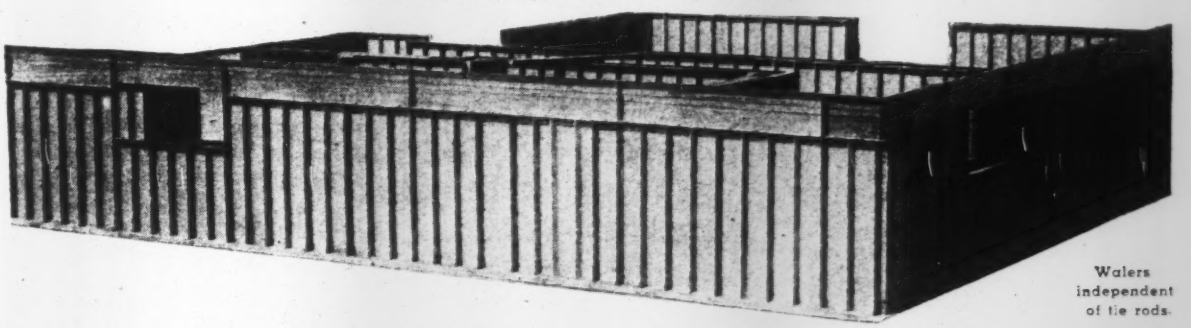
1. **SQUARE EDGE PANELS** in 4" width Multiples erected vertically or Horizontally, gives greater flexibility in forming Footings, Walls, Pilasters, Columns, beams and slabs.
2. **SQUARE EDGE PANELS** with both steel and plywood faces, which are interchangeable, provides a nailing surface where required, for attaching boxes, chamfers, anchors etc.
3. Plain #6 or #8 **WIRE CUT FROM COILS, CRIMPED,** and **SPACED** with the **BULLDOG TOOL** right on the job, or in the **SHOP,** at a cost of only a fraction of a cent, will make a 1500 or a 3,000 lb. tie.
4. **DOUBLE KEYS** for Locking panels and securing the Double steel Channel liner waler in one operation, or Waler Hooks provided where wood liners are desired.
5. **WIRE TIES IN BULLDOG FORMS** are not **DEFORMED** within the **CONCRETE WALL, THEREFORE, BEING STRAIGHT THEY CAN BE REMOVED.**
6. **NO FINISHING REQUIRED** because form panels are made with **SQUARE EDGES. NO SPACERS, NOR BUTTONS,** or **TWISTING OF WIRE TO MAR** the **FINISH CONCRETE SURFACE.**

***Bulldog form panels produce architectural concrete, at the lowest form costs possible, with the least delay, and with the greatest speed.***



Walers independent of tie rods.

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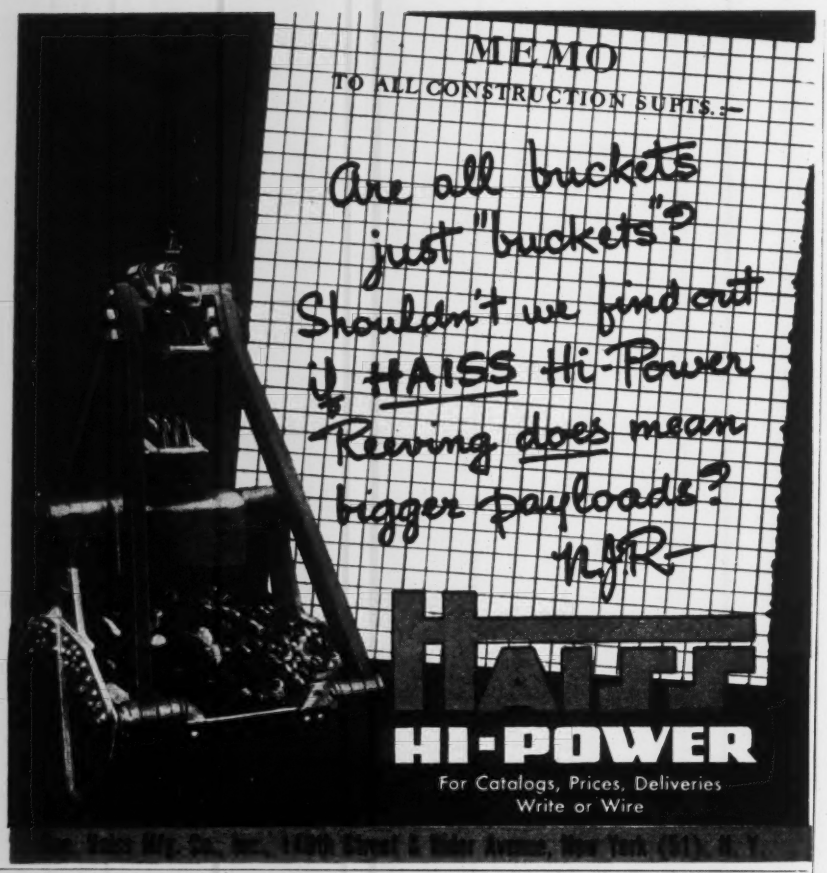
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In less than one minute after pressing the starting switch, Hypressure Jenny Steam Cleaner is ready to instantly loosen and flush away mud, muck and grease from all types of machinery and equipment. Hypressure Jenny Steam Cleaning saves time and money; for one man can do more cleaning with Hypressure Jenny in a single hour than ten men can accomplish in the same time with gasoline, brush and scraper. Hypressure Jenny steam cleaning is safer too because it eliminates the use of volatile cleaning fluids.

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# Elections and Activities

Directors of the Carolinas Branch, Associated General Contractors of America, meeting at Greensboro, N. C., recently to consider ways and means of reducing building costs, agreed generally that overtime pay, usually approved by owners in haste to build, is responsible for as much as 30 per cent of the total cost of construction. They said that only by the application of more efficiency by contractors will there be any immediate effect on building costs, and agreed that economy could be effected by insistence on guaranteed bids rather than escalator contracts.

Hartford, Conn., County Chapter of the Connecticut Society of Professional Engineers has been formed and has 35 members of an estimated 450 qualified engineers in the county. George L. Mylchreest of the engineering firm of Mylchreest & Reynolds, Hartford, was named temporary chairman.

The society is to be a member of the National Society of Professional Engineers. The Connecticut group has started a program for maximum effective utilization of engineers in war time and during national emergencies as adopted by the National Society.

President Richard Lawrie, Jr., Harrisburg, Pa., civil engineer, of the National Society of Professional Engineers appeared at the first meeting and said that our government, if this program is worked out, will be in a position to mobilize all our engineering personnel at a moment's notice. Objectives of the program are:

(1) Prevent waste and misuse of qualified engineering personnel in times of national emergency.

(2) Establish close liaison between civilian and military engineers during peacetime.

(3) Determine whether an organization that will insure better utilization of engineers during national emergencies should be established.

Franklin County (Columbus) chapter, Ohio Society of Professional Engineers, has installed the following new officers: Rolla M. Keatts, Keatts Thermal Equipment Co., president; Myron T. Jones, consulting engineering, vice president; Eugene W. Davis, State Highway Department engineer, secretary; William J. Mead, student chapter at Ohio State University; and the fol-

# TONCAN IRON

## Combines Molybdenum with Extra Copper

It's a proved fact that long-lasting Toncan Iron offers the *highest rust-resistance of all ferrous material in its price class.* Why? Three reasons: (1) The highly refined open-hearth iron, which is its basic ingredient. (2) Extra copper content—actually, twice that of copper-bearing steel and iron. (3) The addition of molybdenum, which multiplies the effectiveness of the alloyed copper.

For nearly 40 years, Toncan Iron has provided low-cost, unfailing rust protection in thousands of different sheet metal installations. It repeatedly has proved itself to be uniformly ductile, easy to fabricate and weld by all methods. And it has demonstrated that it is unaffected by shearing, bending, punching, corrugating, riveting and other cold working.

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*—or write us for detailed information on these Republic Steel Building Products:*
**Pipe—Sheets—Roofing**
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**Taylor Roofing Ternes**
**Berger Lockers, Bins, Shelving,**
**Berger Cabinets for Kitchens**
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REPUBLIC STEEL

**—for ducts, gutters, conductor pipes, roofing, siding, tanks, ventilators, skylights, hoods and other sheet metal applications requiring rust-resistance—and for corrugated metal drainage products**

## THE FIRST RIDGE OR CONTINUOUS VENTILATOR

***Engineered to overcome disadvantages of past designs***

Excessive heat, fumes, smoke, fog and stale air are exhausted from buildings efficiently and economically with this modern ventilating equipment. It's the first ridge type air control engineered to suit practically every industrial need. It corrects poor ventilation and provides a clean, pure, healthful atmosphere that increases efficiency and production. That's why leading architects, engineers and maintenance men recommend Plasteel Air Controls for modern industry.

### ONLY PLASTEEL GIVES YOU THESE EXCLUSIVE FEATURES

1 **100% Exhaust Opening**—No bars, braces, angles or other internal obstructions to impede air exhaust. 100 feet of 12" Air Control provides 100 square feet of clear exhaust opening. Other sizes proportionately.

2 **Free Flow Exhaust**—"Y" type damper provides natural, unrestricted flow exhaust. Eliminates pockets under damper and caps. Thus highest efficiency maintained.

3 **Full Exhaust at all times**—Even when it rains! This improved design eliminates rain crossing the exhaust outlet. Therefore, *full exhaust at all times.*

***PLASTEEL** is standard gauge steel—triple-coated, weather-tested corrosion-proof and maintenance free for long hard service.

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WASHINGTON, PENNSYLVANIA


lowing directors: Robert F. Werner, State Highway Department division engineer, Lloyd W. Ganschow, Jeffrey Manufacturing Co.; Robert N. Tucker, city division of electricity; Charles P. Smith, State Highway Department; John W. Leech, Columbus & Southern Ohio Electric Co.; Guy Elbin, Franklin County engineer; and Arliss Carlen, consulting engineer.

Labor and management saw eye to eye in southern California recently with the organization of the Colorado River Association to protect the area's claims for Colorado River water.

The association is composed of business and labor union leaders, engineers, water and irrigation district officials, citizens and public office holders. At the organization meeting Preston Hotchkis was elected president and Ben P. Griffith secretary of the executive committee.

Purposes of the association are "to advocate and support feasible projects for the diversion and use of water of the Colorado River to the extent that water is available for such projects without impairing the present or future uses of water by established and operating projects" and "to protect the water rights in the Colorado River, both for consumptive use and for power, particularly those rights evidenced by contract with the United States made pursuant to the Boulder Canyon Project Act and in reliance upon which investments have been made and works installed."

The Lakehead (cities of Port Arthur and Fort William, Ont.. Branch of the Engineering Institute of Canada has elected the following officers: Port Arthur's city engineer S. E. Flook as chairman; Fort William's acting city engineer W. E. Maclennan as vice-chairman and D. R. Beckett, assistant resident engineer of Spruce Falls Power and Paper Co., Ltd., at Kapuskasing, Ont. as secretary-treasurer. Executive members for 1947-48 are E. T. Charnock, A. D. Norton, J. I. Carmichael, H. M. Olsson, G. H. Burbidge, G. Erickson, G. H. Lowry and R. W. Emery.

George H. Wheaton has been elected president of the Victoria, B. C., Builders' Exchange, succeeding V. L. Leigh. Walter Luney is vice-president and W. J. Hamilton treasurer. Directors are F. A. Robinson, J. A. Pollard and L. G. Scott, general contractors; H. J. Langdon, electrical; A. H. Davies, flooring; J. Barnes, lumber and millwork; C. N. Mullins, painting; S. J. Ross, plasterers; C. J. McDowell, plumbing and heating; W. McKinty, roofing and sheet metal, and D. E. Smith, supply houses.

The Heil 2-wheel tractor and twin cable scraper make an ideal combination. The 2-wheel tractor provides the speed and power, and the Heil Scraper provides fast, bonus loading, and fast, clean dumping.

# Heil announces The HEILINER for new highs in earthmoving efficiency

**. . . made possible by 21-mph speed, rapid acceleration, easy positive steering, and dependable operation of the *new* Heil 2-wheel Tractor—the Heiliner**

High speed, lots of power, more trips, easy handling—you get all these in the new Heil 2-wheel tractor.

Although this unit is new to you, it is not new to Heil engineers. They job-tested it thoroughly in all kinds of weather, over all kinds of ground and fill conditions; made revolutionary improvements; added new features not found in conventional units of this type—so that today, this 2-wheel tractor is ready to go to work cutting costs for you.

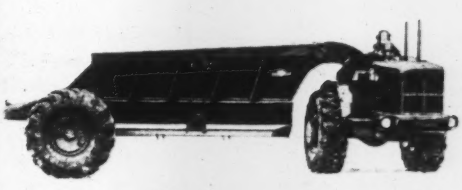
Here are a few of the features responsible for higher standards of performance, increased ease of operation, and greater economy:

- **Powerful, dependable Diesel engine**—famous, easy-starting International UD18A supplies the power.
- **Passenger-car steering** — exclusive Heil Hydrosteer provides hydraulic steering; prevents snaking, hunting, or nosing; and reduces operator fatigue.
- **Concentration of load on driving wheels**—even when the unit is empty, 70% of the gross weight is on the driving wheels, providing better traction over both rugged terrain and soft fills.
- **High speed and unusual maneuverability**—the Heil 2-wheel tractor has a 65-degree turning angle on each side. When equipped with a Heil Cable Scraper, it turns on a 22-foot radius.

Here is just the unit to take the kinks out of your earthmoving program—to open up the bottlenecks. Write us for latest descriptive literature or get the facts from the International Power Distributor nearest you.

R-91

Equipped with Heil's high-clearance (35" with doors open) bottom-dump wagon, this new 2-wheel tractor unit speeds hauling and dumping.



**THE HEIL CO.**

GENERAL OFFICES • MILWAUKEE 1, WISCONSIN

# On the spot for supplies?

## Get'em fast by Air Express

**You get supplies** and equipment the fastest possible way when you specify Air Express. This speedy service makes hay out of shipping time—delivers you what's needed in hours instead of days.

Your shipment travels at speeds up to five miles a minute by Air Express. Because Air Express goes on all flights of all Scheduled Airlines, no time is lost waiting for loads to accumulate. Regular use of Air Express keeps your business running in high gear — helps give customers better service. Frequent flights to and from points overseas make foreign shipping problems simple, too.

## Specify Air Express-it's Good Business

- Low rates — special pick-up and delivery in principal U.S. towns and cities at no extra cost. • Moves on all flights of all Scheduled Airlines.
- Air-rail between 22,000 off-airline offices.
- Direct air service to and from scores of foreign countries.

Just phone your local Air Express Division, Railway Express Agency, for fast shipping action . . . Write today for Schedule of Domestic and International Rates. Address Air Express, 230 Park Ave., New York 17. Or ask for it at any Airline or Railway Express Office. Air Express Division, Railway Express Agency, representing the Airlines of the U.S.

AIR EXPRESS

AIR EXPRESS GETS THERE FIRST

**Fastest delivery—at low rates**

Engine parts (36 lbs.) picked up at Portland, Ore., factory late on 10th. Delivered to Los Angeles consignee 821 miles away, 9 AM on 11th *in time*. Air Express charge — $8.84! Other weights, any distance, similarly inexpensive and *fast!*

1927— 20TH YEAR OF GETTING THERE FIRST! — 1947


# Manufacturers' Activities

F. E. REISHUS, formerly manager of International Harvester at Sioux Falls, S. D. has been transferred to Lincoln, Neb., to succeed Mr. J. L. Henn who has retired. E. R. Zimmerman has been promoted to branch manager at Sioux Falls.

To provide an expanded and more fully coordinated service to steel consumers in the Chicago area, the Chicago sales units of CARNEGIE-ILLINOIS STEEL CORP. were combined July 1, 1947. The enlarged organization is directed by Griswold A. Price, manager of this United States Steel subsidiary's Chicago district sales office. Reporting to Mr. Price are Edward W. Backes, railroad industries sales manager, John H. Morava, manufacturing industries sales manager, and George O. With, construction industries sales manager.

Four new district sales representatives of the M-R-S MANUFACTURING CO., Flora and Jackson, Miss., manufacturers of the Mississippi Wagon, have been appointed: Thomas Q. Hathorn, Hollis H. McBride, Charles Robert Morris, and Harper Hughes Spragins. All four men recently completed an intensive training course at the M-R-S factory and offices and in the field.

MINNEAPOLIS-HONEYWELL REGULATOR CO., has formed a subsidiary company in Mexico. Marking the sixth foreign subsidiary organized by Honeywell, the new firm has been named Honeywell-Brown, S. A. All legal formalities have been completed, and personnel engaged. Headquarters of the new company have been established in Mexico City. Virgil H. Hiermeier has been named manager.

After 32 years service, WALTER L. HEMPELMANN, consulting engineer of the Chicago division of The Texas Co.'s asphalt sales department, retired on Aug. 1st of this year. Prior to joining The Texas Company in 1915, Mr. Hempelmann served the city of St. Louis, Mo. for nine years.

C. A. FEGTLY has been appointed manager, and F. W. DE KLOTZ sales manager of the Pacific Coast division of Pittsburgh-Des Moines Steel Co., with headquarters at the company's new Santa Clara, Calif., fabricating plant.

THE GALION IRON WORKS & MFG.

# STEEL DECK . . . Goes to SEA!

The Decks of the "Delaware Belle", new Wilson Line Excursion Boat, are of Mahon Steel Deck rolled from Yoloy.

## . . . Versatility of MAHON STEEL DECK Permits Myriad of Uses in Modern Construction

Mahon Steel Deck, rolled from high-tensile, low alloy Yoloy, was used for decks of the all-welded, all-steel constructed "Delaware Belle", of the Wilson Line, illustrated here . . . this is typical of numerous new applications by alert designers in which Steel Deck solved their problem of light weight construction with adequate strength and rigidity. You will find that Mahon Steel Deck, due to its basic design, with narrow, vertical-leg stiffening ribs, lends itself to a broader range of uses in modern construction. See Mahon's Insert in Sweet's File for complete information, specifications and latest construction details, or consult a Mahon representative.

The all-welded, all-steel constructed "Delaware Belle". All three of the upper decks are Mahon Steel Deck rolled from high tensile, low-alloy Yoloy.

**THE R. C. MAHON COMPANY**

Home Office and Plant, Detroit 11, Michigan

*Representatives in all Principal Cities*

Manufacturers of Steel Deck for Roofs, Sidewalls, Ceilings, Floors, Partitions and Doors. Also Roof Sumps and Recesses, Rolling Steel Doors, Grilles, and Underwriters' Labeled Rolling Steel Doors and Fire Shutters.

# MAHON

Co., Galion, Ohio, manufacturer of motor graders and rollers, reports the promotion of G. D. Finney from assistant sales manager to sales manager of the company's western and southern divisions. Robert C. Monnett has been appointed sales manager of the eastern and central divisions of the company.

LINK-BELT Co., Chicago, Ill. announces the appointment of Robert C. Becherer as plant manager of the Ewart plant in Indianapolis, where conveyor and drive chains are made. Warren H. Maxwell has been appointed general superintendent, S. L. Houck becomes assistant general superintendent and Carl O. Schopp has been appointed superintendent of the Ewart plant foundry.

O. A. SCHILLING has been named eastern sales manager of Goodyear Tire & Rubber Co's mechanical goods division, it was announced, succeeding H. D. Foster, who was recently appointed manager of the mechanical goods division.

KENNAMETAL INC., Latrobe, Pa., manufacturer of cemented carbide tools, announces appointment as tool engineer and representative of Charles Herbert Bodner in the Los Angeles area; John H. Wright in New England; and Richard H. Oberholtzer in the Detroit area. Kennametal also has appointed Ludwall & Co., V. Hamngatan 5, Goteborg, as a distributing representative in Sweden.

Appointment of W. C. SNYDER, JR., as a vice president in the engineering and construction division of Koppers Co., Inc., Pittsburgh, Pa., is announced. He succeeds John F. Byrne, vice president, who was killed in an airplane crash.

PACIFIC STATES STEEL CO. is installing four 75-ton capacity open hearth furnaces to more than double the raw steel output of its Niles, Calif., plant. The new facilities will add an estimated 140,000 tons to the 3,500,000 tons annual capacity of western plants. The furnaces were purchased from a governmental surplus steel plant in the Midwest.

GEORGIA HARDWOOD LUMBER CO. has purchased controlling interest in the Bellingham Plywood Corp. of Bellingham, Wash., which has a 75-million-foot annual capacity Douglas fir plywood manufacturing plant. Victor Olson, vice-president and general manager of Bellingham, will become president and Owen R. Cheatham, president of Georgia Hardwood, will become chairman of the board of Bellingham.

WILLIAM R. DEMMER has been appointed assistant general manager of the Zeropoint Water Softener Co., Milwaukee, Wis.

THE CECO STEEL PRODUCTS CORP. of Chicago and Omaha, Neb. has promoted Walter E. Lord, manager of its office in St. Paul to the office of district manager at Milwaukee. Lester R. Wise was named manager of the Chicago office of Ceco's merchant trade division. Bernard H. Lord has been appointed district manager of Ceco's New Orleans office.

HENRY W. KAYSER, design and development engineer with the Falk Corp., Milwaukee, since 1931, has been appointed supervisor of development engineering.

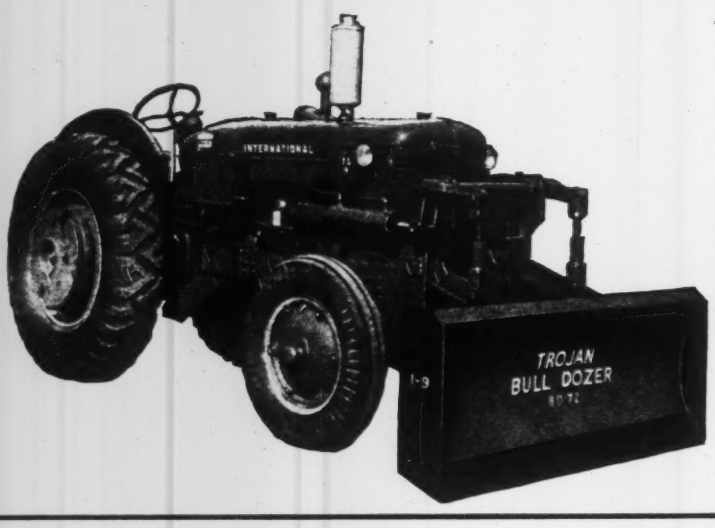
EDWARD D. TOWNSEND, for 35 years affiliated with the Beckwith Machinery Co., was tendered a testimonial dinner at the Pittsburgh Athletic Association recently on the occasion of his retirement as vice president.

E. W. RYDER's promotion to the posi-


# TROJAN

## COMBINATION BULLDOZER AND SNOW PLOW

**for International Industrial Wheel Type Tractor**




**Trojan Bulldozers are designed for mounting on International Industrial Wheel Tractors, I-9, I-6 and I-4, and provide year around service. The bulldozer blade and V type or reversible blade snow plows are interchangeable. Field installation is easy and full mounting instructions accompany each shipment.**

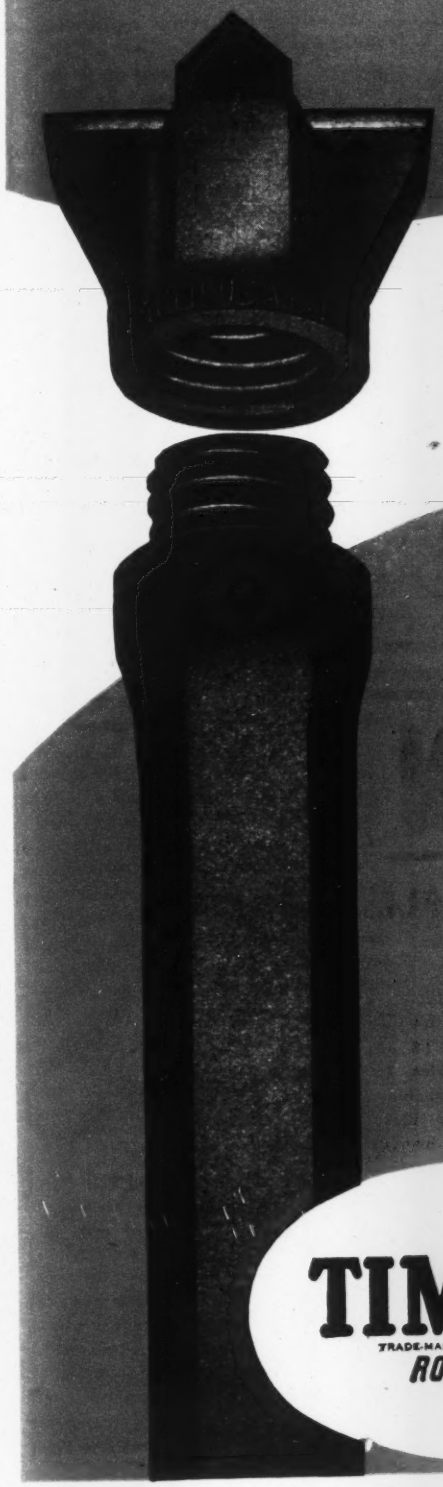
**The patented parallel blade lift holds the blade in a vertical position at all times and prevents "digging in" and consequent stalling and wheel slippage. Another feature is the mechanical float position which provides flexible blade operation without common difficulty of operating four-way valve.**

*Write for literature and specifications or see your International Industrial Distributor.*

**CONTRACTORS MACHINERY CO., INC.**

**DEPT. NR 72 BATAVIA, N. Y.**

# Uniform Performance



## an outstanding Quality of TIMKEN BITS

The ability of Timken Rock Bits to drill faster and further in any kind of rock has made them preferred wherever rock is drilled — in mining, construction and quarrying.

Equally important to their users however — even rated first by some — is uniformity of performance. This means that every Timken Bit will give the same outstanding service in speed of penetration and distance drilled when used in the same kind of rock.

This uniformity is due to the development of the special Timken Steel used in the production of Timken Bits and to Timken metallurgical "know how" in heat treatment and hardening.

Wherever you are, there's a Timken Rock Bit distributor within telephone call. Conversion and reconditioning shops also are conveniently located for quick service. Put Timken Bits to work now and cut your drilling costs while increasing production. The Timken Roller Bearing Company, Canton 6, Ohio.

**TIMKEN**

TRADE-MARK REG. U. S. PAT. OFF.

ROCK BITS

Before you specify the transmission you want installed in your heavy-duty trucks, investigate to make sure the unit you designate meets these important requirements:

Do experienced fleet owners endorse its performance on the job?
Are the materials used in its manufacture of the highest quality?
Is it quiet-running, easy-shifting, and long-wearing?
Does it provide a wide range of gear ratios to meet every road and load condition?

Fuller Transmissions and Auxiliaries satisfy all of these exacting requirements of heavy-duty service. Write for the booklet entitled "Why Fuller Transmissions" and read the on-the-record reports of veteran fleet operators. Then invest soundly by specifying proved-in-the-field and geared-to-the-job Fuller Transmissions.

**FULLER MANUFACTURING CO., TRANSMISSION DIVISION**
**KALAMAZOO 13F, MICHIGAN**
*Unit Drop Forge Division, Milwaukee 1, Wisconsin*
*Western District Office (Both Divisions): 577 14th Street, Oakland 12, California*

Fuller TRANSMISSIONS

# PREHY GROUTERS— WEBER SYSTEM

New indispensable Equipment for Contractors, Railroads, Mines and all public and private Construction Departments.

Plastic and Fluid Pressure Grouting, Pneumatic Concrete Construction, Railway Track and Soil Stabilization, Correction of Structural Deficiencies, Subsiding Foundations, Floors, Drypack Concrete and many other practical uses.

*Write for complete information*

**The Prehy Co., Inc.** 420 LEXINGTON AVE NEW YORK 17, U.S.A.

tion of parts manager for the eastern division of Caterpillar Tractor Co., Peoria, Ill., is announced. He replaces C. D. Byrns who resigned as eastern division parts manager to join Arizona Machinery Co., "Caterpillar" distributor. W. E. Doersam has been named assistant parts manager for the western division.

According to a recent announcement the SWAN-FINCH OIL CORP., has appointed B. C. Price vice-president in charge of manufacturing.

O. S. BROCK, formerly assistant manager of the Bemis Cotton Mill, Bemis, Tenn. has been appointed manager of the Indianapolis Bleaching Co., Indianapolis, Ind. At the same time Bemis Bro. Bag Co. announces the opening of a sales office at 630 Security Bldg, Phoenix, Ariz., in charge of H. O. Parrent.

J. G. WEST has been promoted to sales manager of the Indiana division of the Lone Star Cement Corp., while Harry E. Green was named assistant treasurer of the division, which has offices in the Merchants Bank Building, Indianapolis. They succeed J. H. Leikhim, who has been elected a vice president and treasurer of the company in New York.

REGINALD ROCKWELL was elected a director of Hercules Powder Co., Wilmington, Del., it was announced recently. He is general manager of the paper makers chemical department.

One of the best safety records in years among heavy industrial organizations was disclosed in a National Safety Council report that twelve plants of CARNEGIE-ILLINOIS STEEL CORP. U. S. Steel subsidiary, had operated without a single lost-time accident over a combined period of 25,000,000 manhours of working time. Employing 80,000 persons, six plants in the Pittsburgh area, three in the Youngstown district, and three in the Chicago district piled up the record, which represents an average of more than 2,000,000 manhours each without lost time due to accidental injury.

Fred W. Sparks has joined THE BUDA CO. as district representative to handle the Ohio territory for the manufacturer's engine division.

The auto industry's first postwar assembly plant, almost 29 acres of car and truck assembly area devoted exclusively to the production of CHEVROLET vehicles at the rate of 80 units per hour, was thrown open recently for a press preview of the nation's newest and most spacious auto assembly facilities.

"Impossible" is a word that is not recognized by engineers. To dam a mighty river, tunnel under it or suspend a bridge across it—things such as these that once seemed pure imagination were made possible by instruments devised to refine and extend human faculties, to translate the precision of engineering thought into action.

Keuffel & Esser Co. is proud to have played so large a part in making such instruments widely available. In this way K & E equipment and materials have been partners of the engineer and draftsman for 78 years in shaping the modern world. So universally is this equipment used, it is self-evident that K & E have played a part in the completion of nearly every engineering project of any magnitude. Could you wish any surer guidance than this in the selection of your own "partners in creating"?

Not only for construction and building, but for setting up precision machine tools and long production lines, in the fabrication of large ships and aircraft, experienced engineers know that they can rely utterly on K & E transits and levels. Coated lenses for increased light transmission, precision-ground adjusting screws, chromium-coated inner center and draw tubes, completely enclosed leveling screws, improved achromatic telescopes—all these typify the advanced design of these instruments.

# partners in creating

. . . the world's busiest tunnels
. . . largest telephone system
K+E
Drafting, Reproduction, Surveying Equipment and Materials, Slide Rules, Measuring Tapes.
KEUFFEL & ESSER CO.
EST. 1867
NEW YORK • HOBOKEN, N. J.
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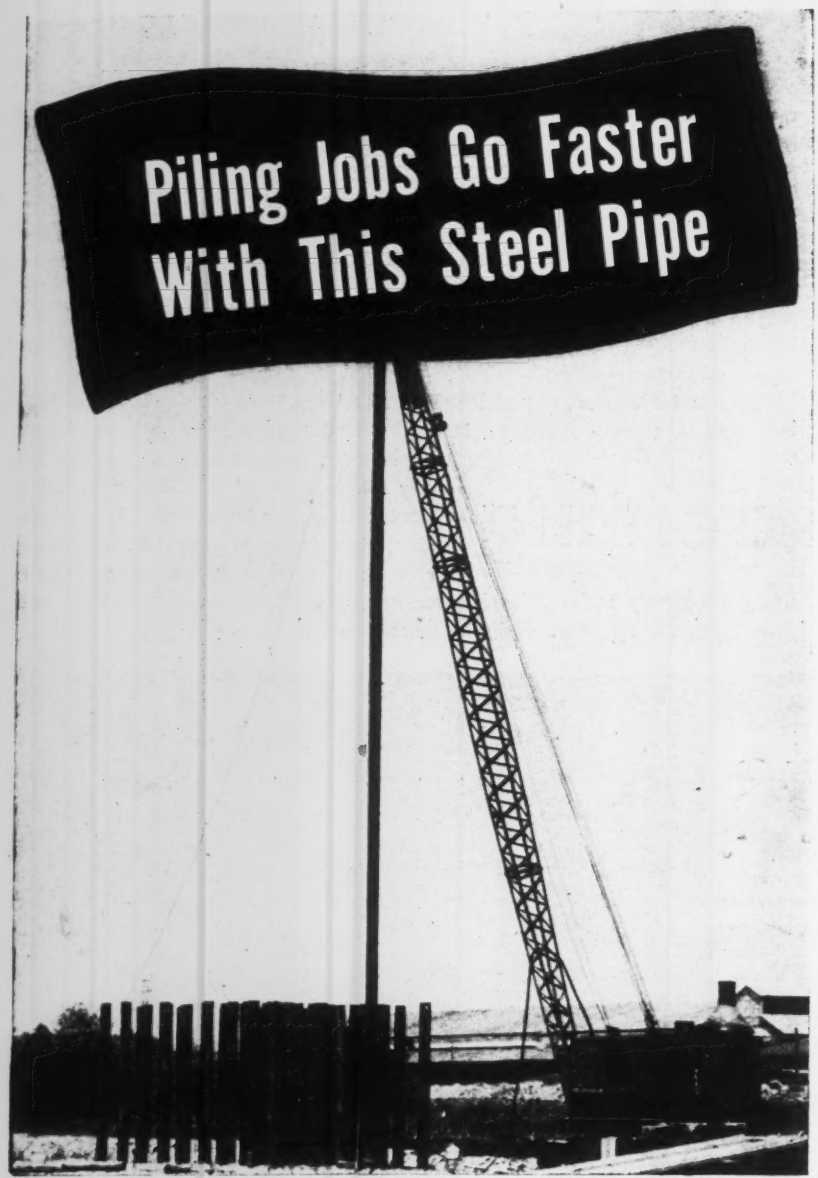
LOS ANGELES • MONTREAL




You can keep right on schedule and do a more efficient job when you use ARMCO Spiral Welded Piling for your foundation work.

These piles drive *straight* and *fast* with the least time and effort. The tough spiral weld imparts extra lateral stiffness and high collapse-resistance to even the longest lengths. Yet ARMCO Foundation Piles are relatively light, which makes for quick, easy handling. And you can save driving time by specifying long lengths.

For greatest economy specify the exact wall thickness you need. Diameters range from 6 to 36 inches, wall thicknesses from .109 to .500 inch. When you need end plates, cone points, or cutting shoes, these can be mill-attached. Ask us for a quotation on your next foundation job. Just address Armco Drainage & Metal Products, Inc., 2145 Curtis Street, Middletown, Ohio.

ARMCO

**ARMCO FOUNDATION PILES**


# Manufacturers' Publications

**Gears**—(24-p. catalog) Describes, in pictures, blueprints and text, various types and sizes of gears and special machinery.—*Earle Gear and Machine Co., 4707-17 Stenton Ave., Philadelphia 44, Pa.*

**Earth Boring Machine**—(16-p. bulletin) Describes three new compressed-air operated models 10-A, L-2 and LHH-2 for drilling horizontal holes 2 to 14½ in. in dia.—*Hydrauger Corp., Ltd., 116 New Montgomery St., San Francisco 5, Calif.*

**Magnetic Clutches**—(20-p. catalog) Provides complete text book on magnetic clutch application and contains specifications, illustrations, torque formulas and other valuable information on magnetic friction device control.—*Stearns Magnetic Mfg. Co., Milwaukee 4, Wis.*

**Clay Products**—(Bulletin) Carries dimensions and specifications of sizes and fittings of various clay products widely used.—*Robinson Clay Products Co., Akron, Ohio.*

**Pumps**—(180-p. catalog) Covers industrial lines of pumps, including numerous types of centrifugal pumps, sump pumps, cellar drainers, deep well turbine pumps, high pressure pumps, condensation return units, boiler feed pumps, mine pumps, Triplex pumps, "Turbo-Flo" pumps and rotary pumps.—*Deming Co., Salem, Ohio.*

**Large Forged Nuts**—(6-p. folder) Describes facilities for manufacturing large forged nuts in any thread and finish and illustrates hydraulic pressed and flat die forging facilities.—*Jos. Dyson & Sons, Inc., 5125 St. Clair Ave., Cleveland 14, Ohio.*

**Plywood Panel**—(Illustrated brochure) Describes Weldtex, plywood with striations in panel to relieve surface tension, minimizing expansion and contraction.—*United States Plywood Corp., 55 W. 44th St., New York 18, N. Y.*

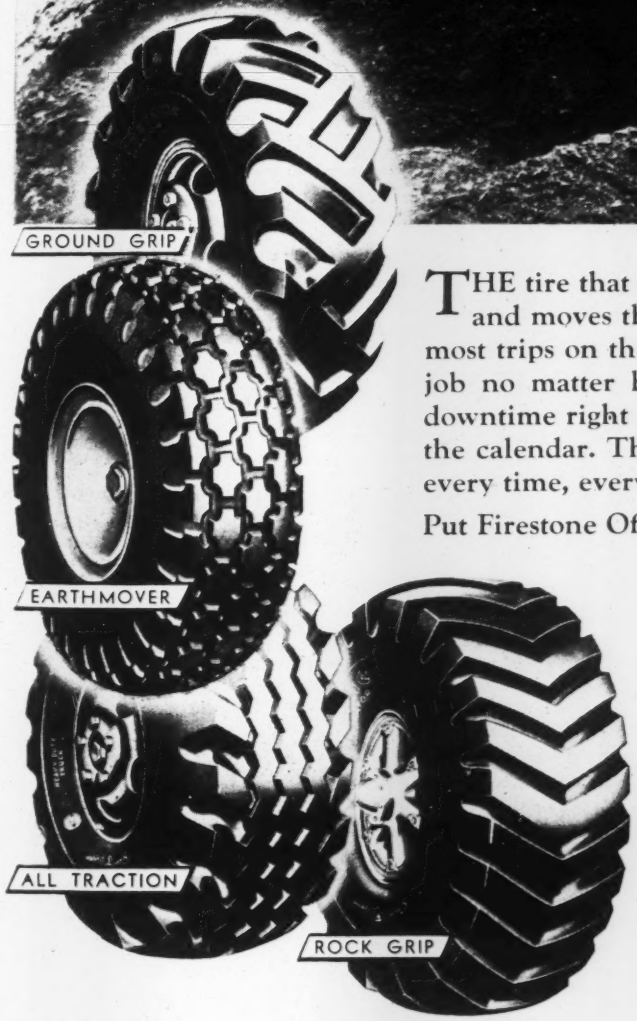
**House Connection Pipe**—(8-p. brochure) Describes Transite, asbestos-cement product used in sewage disposal lines from private residences and commercial buildings to street sewers or septic tanks. Photographs

# Where Extra Traction Means Extra Dollars—

## THEY CHOOSE THE FAMOUS

# Firestone

## GROUND GRIP




THE tire that pays off on the job is the tire that digs in and moves the most dirt . . . or rock . . . or makes the most trips on the haul road. It's the tire that stays on the job no matter how tough the going; the tire that cuts downtime right to the bone — around the clock — across the calendar. That's the Firestone Off-the-Highway Tire, every time, everywhere.

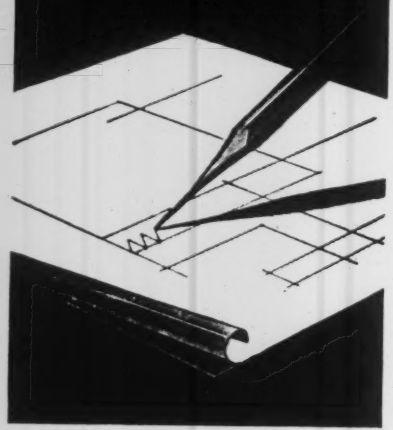
Put Firestone Off-the-Highway Tires on your jobs and let us show you how Firestone Project Service will keep them there, operating at minimum cost.

For further details, and without obligation, write The Firestone Tire & Rubber Company, Akron 17, Ohio.

*Listen to the Voice of Firestone every Monday evening over NBC*

**Firestone**
**OFF-THE-HIGHWAY TIRES**

TRACING CLOTH
for
HARD PENCILS



● Imperial Pencil Tracing Cloth has the same superbly uniform cloth foundation and transparency as the world famous Imperial Tracing Cloth. But it is distinguished by its special dull drawing surface, on which hard pencils can be used, giving clean, sharp, opaque, non-smudging lines.

Erasures are made easily, without damage. It gives sharp, contrasting prints of the finest lines. It resists the effects of time and wear, and does not become brittle or opaque.

Imperial Pencil Tracing Cloth is right for ink drawings as well.

IMPERIAL PENCIL TRACING CLOTH

SOLD BY LEADING STATIONERY AND DRAWING MATERIAL DEALERS EVERYWHERE


and explanatory captions clearly show four simple steps needed in assembling pipe.—*Johns-Manville, Box* 290, *New York* 16, *N. Y.*

**Shovels**—(40-p. bulletin) Covers P&H 1055 shovel. Many large pictures show machine at work in coal fields, quarries, on irrigation projects, and other jobs.—*Harnischfeger Corp., Excavator Division,* 4400 *W. National Ave., Milwaukee* 14, *Wis.*

**Welding Accessories**—(16-p. bulletin) Describes complete line of welding accessories that will be carried in stock at each of company's district offices.—*Metal & Thermit Corp.,* 120 *Broadway, New York* 5, *N. Y.*

**Steel Service Facilities** — (12-p. booklet) Gives quick picture of stocks, facilities and personnel at company's new Los Angeles plant.—*Joseph T. Ryerson & Son, Inc., P. O. Box* 3817, *Terminal Annex, Los Angeles* 54, *Calif.*

**Impact Breaker**—(8-p. bulletin) Describes Cedarapids Kubit impact breaker, with examples of its use on actual jobs.—*Iowa Manufacturing Co., Cedar Rapids, Iowa.*

**Centrifugal Pumps**—(4-. bulletin) Tells of operating advantages and construction features of new line of "Pedrifugal" pedestal-type centrifugal pumps. — *Allis-Chalmers Mfg. Co., Milwaukee* 1, *Wis.*

**Sanitary Engineering Equipment**—(4-p. leaflet) Previews six units of new equipment: S-7 clarifier; duo-clarifier; duo-filter; Type M digester; external sludge heater; and Sulzer screenings disintegrator.—*The Dorr Co.,* 570 *Lexington Ave., New York* 22, *N. Y.*

**Lubricant Research**—(24-p. booklet) Gives picture story of research program for developing improved industrial lubricants. Forty-eight photographs show advanced lubricant research devices, including pilot plants, endurance testing machines, micro-laboratory equipment, electron microscopes and spectrometers.—*Gulf Oil Corp., 3800 Gulf Building, Pittsburgh 30, Pa.*

**Pit, Quarry, Mine and Bituminous Equipment**—(Pocket reference booklet) Contains factual data and information on aggregate specifications, belt conveyor capacities, crusher settings, horsepower required for various units of equipment, screen data, weights of materials, horsepower rating of belts, safe loads on beams, conversion tables, keys and keyway data.—*Pioneer Engineering Works, Inc.,* 1515 *Central Ave., Minneapolis* 13, *Minn.*


Where to buy
ESNA
TRADE MARK
ELASTIC STOP NUTS

INDUSTRIAL JOBBERS

**COLORADO:** M. L. Foss, Inc., 1901 Arapahoe St., Denver. **CONNECTICUT:** C. S. Mersick & Co., 260 State St., New Haven. **ILLINOIS:** Supplies, Inc., 564 West Adams Street, Chicago; Globe Machinery & Supply Co., 617 Fifteenth St., Moline. **INDIANA:** The Central Rubber & Supply Co., 120 South Meridian St., Indianapolis. **IOWA:** Globe Machinery & Supply Co., 205 Third Ave., S. W., Cedar Rapids; Globe Machinery & Supply Co., East First St. & Court Ave., Des Moines. **KENTUCKY:** Neill-LaVielle Supply Co., Inc., 505 West Main St., Louisville. **MARYLAND:** Carey Machinery & Supply Co., 119 East Lombard St., Baltimore. **MASSACHUSETTS:** Chandler & Farquhar Co., 900 Commonwealth Ave., Boston; J. Russell & Co., Inc., 361 Dwight St., Holyoke; Brierly, Lombard & Co., Inc., 107 Foster St., Worcester. **MICHIGAN:** The Charles A. Strelinger Co., 149 East Larned St., Detroit. **MINNESOTA:** Kelley-How-Thompson Co., 309 South Fifth Ave., Duluth; Kulseth Supply Co., 117 Washington Ave., Fargus Falls; Minneapolis Iron Store, 524 North Washington, Minneapolis; Uptown Iron Store, 918 West Lake St., Minneapolis; Berg Supply Co., Willmar. **MISSOURI:** The Faeth Co., 1608 McGee St., Kansas City. **MONTANA:** Kelley-How-Thompson Co., Billings. **NEW JERSEY:** Brodhead-Murphy Co., 525 West Grand St., Elizabeth. **NEW YORK:** Beals, McCarthy & Rogers, Inc., 50 Terrace, Buffalo; A. N. Nelson, Inc., 370 Hamilton Ave., Brooklyn; Keystone Nut & Bolt Co., 62 Murray St., New York City; Syracuse Supply Co., 314 West Fayette St., Syracuse. **NORTH DAKOTA:** Empire Supply Co., Fargo; Minot Supply Co.,Minot; Grand Forks Supply Co., Grand Forks. **OHIO:** The E. A. Kinsey Co., 331 Fourth St., West Cincinnati; Strong, Carlisle & Hammond Co., 1392 West 3rd St., Cleveland; The Smith Brothers Hardware Co., 580 North Fourth St., Columbus; The M. D. Larkin Co., 115 East Third St., Dayton; Mill & Factory Supply Co., 622 Southard St., Toledo. **PENNSYLVANIA:** Emco Supply Co., Lansford; Standard Shannon Supply Co., 13 Letitia St., Philadelphia; Somers, Fitler & Todd Co., 327 Water St., Pittsburgh; E. Keeler Co., 238 West St., Williamsport. **RHODE ISLAND:** The Congdon & Carpenter Co., 405 Promenade St., Providence. **SOUTH CAROLINA:** Taylor Parker Co., Florence. **SOUTH DAKOTA:** Aberdeen Supply Co., Aberdeen; Cave Supply Co., Watertown. **TEXAS:** Peden Iron & Steel Co., 700 North San Jacinto St., Houston. **VIRGINIA:** Taylor Parker Co., Inc., 47 Commercial Place, Norfolk; Taylor Parker Co., Inc., 801 East Carey St., Richmond. **WASHINGTON:** Northwest Nut & Bolt Co., 4502 Fourteenth Ave., N. W., Seattle. **WEST VIRGINIA:** Superior Sterling Co., 200 Bluefield Ave., Bluefield. **WISCONSIN:** John Pritzlaff Hardware Co., 333 North Plankinton Ave., Milwaukee.

SALES OFFICES AND SALES ENGINEERS

A. K. Whitaker, 4076 Powers Ferry Rd., N.W., **ATLANTA,** Ga.; 20 North Wacker Drive, **CHICAGO,** Ill.; 1836 Euclid Ave., **CLEVELAND,** Ohio; 522 New Center Bldg., **DETROIT,** Mich.; R. G. Brandes, 1205 Milford St., **HOUSTON,** Tex.; Collins-Powell Co., 9247 Alden Dr., Beverly Hills, **LOS ANGELES,** Calif.; 115 Broadway, **NEW YORK CITY;** H. J. Forst, 225 Catalpa Place, **PITTSBURGH,** Pa.; 2330 Vauxhall Rd., **UNION, N. J.** In **CANADA:** A. J. Campbell & Co., Box 430 (Place d'Armes), Montreal.

***The ESNA advertisement shown opposite this column explains the dependable protection provided by all types of Elastic Stop Nuts.***

**Dewatering Coal**—(4-p. bulletin) Describes and illustrates Eliptex dewaterizer, giving case histories to demonstrate ability of this method to remove surface moisture from coal and other materials.—*Robins Conveyors Division, Hewitt-Robins, Inc.*, 270 *Passaic Ave., Passaic, N. J.*

**Steam Cleaning Unit**—(12-p. booklet) Describes new steam cleaning unit, with data on construction, engineering specifications, types of models available, and job applications of latest model.—*Oakite Products, Inc.*, 124G *Thames St., New York* 6, *N. Y.*

**Jacks**—(Engineering data bulletin) Describes Simplex jacks for supporting and leveling tanks. Complete specification charts, selection guide data and price listings are included.—*Templeton, Kenly & Co.*, 1020 *S. Central Ave., Chicago* 44, *Ill.*

**Tracing Cloth**—(12-p. booklet) Contains 8½x3½-in. samples and specifications of four types of tracing cloth for ink or pencil drawings.—*Arkwright Finishing Co., Providence, R. I.*

**Hand Tools**—(Bulletin No. 4728) Describes and illustrates 24 pliers, 12 adjustable wrenches and 6 pipe wrenches.—*Plomb Tool Co.*, 2209B *Santa Fe Ave., Los Angeles* 54, *Calif.*

**Tile Engineering**—(453-p. handbook) Describes shapes and sizes of structural clay tile, including facing tile, and contains detailed information and recommendations regarding mortar, design and properties of structural tile walls, and design and construction of walls, partitions, footings, foundations, piers and pilasters. Appendix contains estimating tables and specifications for various kinds of tile construction. It is priced at $4.50, with special price of $2.50 to registered architects and engineers.—*Structural Clay Products Institute*, 1756 *K St., N. W., Washington* 6, *D. C.*

**Lubricating Grease**—(6-p. folder) Covers, in question-and-answer form, new lubricating grease for use on all open gears and bearings. Manufacturer claims that this is closest approach to permanent lubricating medium that has yet been achieved.—*Knapp Mills, Inc.*, 121 *Broad St., New York* 4, *N. Y.*

**Diesel Engines**—(Two 8-p. pamphlets) Gives complete specification for UD-14A and UD-18A diesel engines and power units. Bearing areas, moments of inertia, material specifications, and dimensions are listed.—*International Harvester Co.*, 180 *N. Michigan Ave., Chicago* 1, *Ill.*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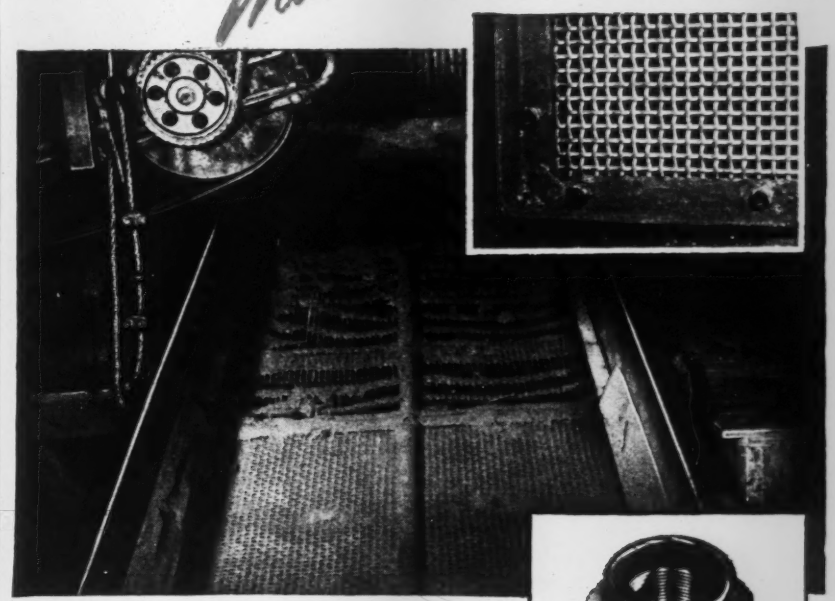

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Vibration-loosened fasteners were once a production problem in the cinder block plant of the Plasticrete Corporation at Hamden, Conn. The violent reciprocating action of the screens shook ordinary fasteners loose and permitted them to drop into the block moulds. Production was interrupted constantly to repair the damaged moulds.

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ESNA Elastic Stop Nuts are the *only* detachable fasteners used on Plasticrete's screens. This standardization achieves the double economy of inventory simplification and reduced procurement costs. For further information address: Elastic Stop Nut Corporation of America, Union, New Jersey. Sales Engineers and Distributors are conveniently located in many principal cities.

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It is threadless and permanently elastic. Every bolt—*regardless of commercial tolerances*—impresses (does not cut) its full thread contact in the Red Elastic Collar to fully grip the bolt threads. In addition, this threading action properly seats the metal threads—and eliminates all axial play between bolt and nut threads.

All ESNA Elastic Stop Nuts *—regardless of size or type—* lock in position anywhere on a bolt or stud. Vibration, impact or stress reversal cannot disturb prestressed or positioned settings.

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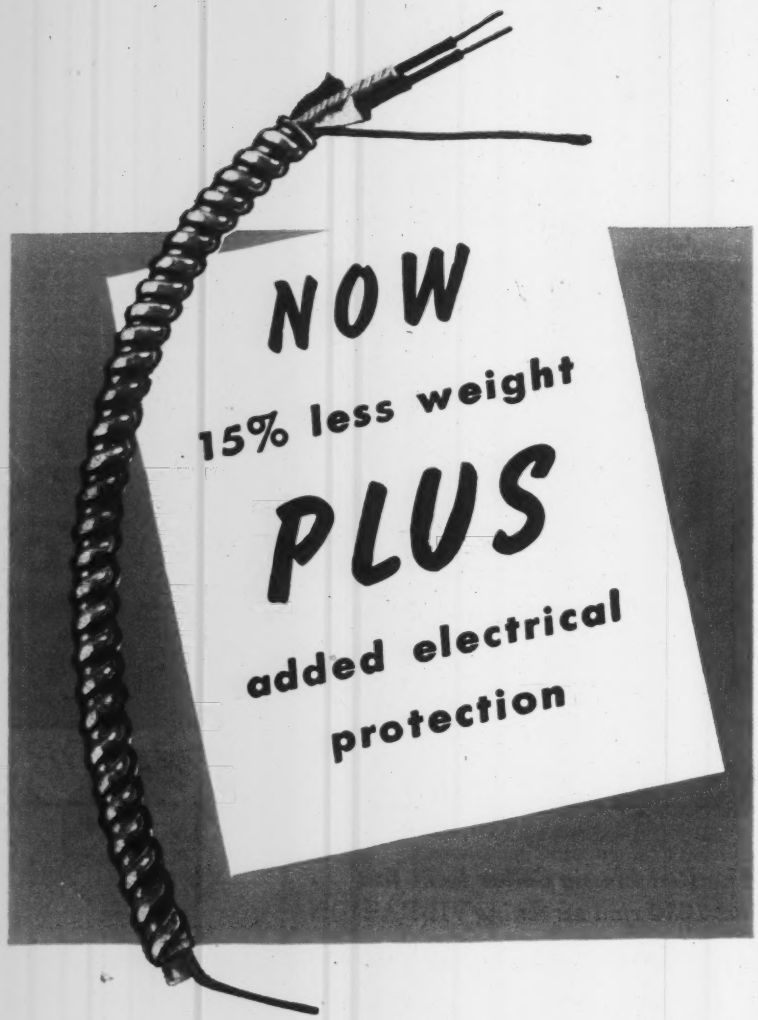


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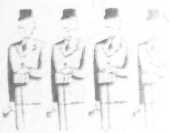

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## News of the Week

(*Continued from page 77*)

### *Large dam is started on So. Saskatchewan River*

An earth-filled dam—part of a $66,000,000 power and irrigation project is now under construction 18 miles upstream from Outlook on the South Saskatchewan River in Saskatchewan, Canada.

Report on the investigation for a suitable dam site in the river development, which would create a reservoir with a total storage capacity of 6,765,000 ac. ft., was compiled by G. L. Mackenzie, chief engineer, and concurred in by Maj. Gen. H. B. Ferguson, American consulting engineer. The project will require about 12 years to complete.

It is estimated that the ultimate irrigable area will be 500,000 acres. Of this total 123,000 acres will be irrigated by gravity and 377,000 acres by pumping with power generated at the dam.

The plan provides for the ultimate installation of 119,500 h.p. of hydraulic turbines. 2nd. During the initial stage of the development a maximum of 416,000,000 kwh. of electrical energy would be available for sale.

### *Ohio reservoir to have recreation facilities*

The Conservancy Court, composed of the county judge from each of the 18 counties making up the Muskingum, Ohio, Watershed Conservancy District, has granted permission for the district to issue bonds in the amount of $600,000 for construction of recreational improvements at eight of the 14 reservoirs under its jurisdiction. Work, however, is to be carried forward at only three sites for the present; improvements at the other five will be made later. At the Atwood reservoir, near Dover, the Seneca, near Cambridge, and the Pleasant Hill, near Ashland, plans call for construction of bathing beaches, parking areas, boat docks, shelter houses, toilet facilities, overnight and vacation type cabins that would make these reservoirs the recreation centers for their respective areas.

In order that work can be started this summer, plans call for immediate financing to be accomplished through issuance of short term notes; these will be re-


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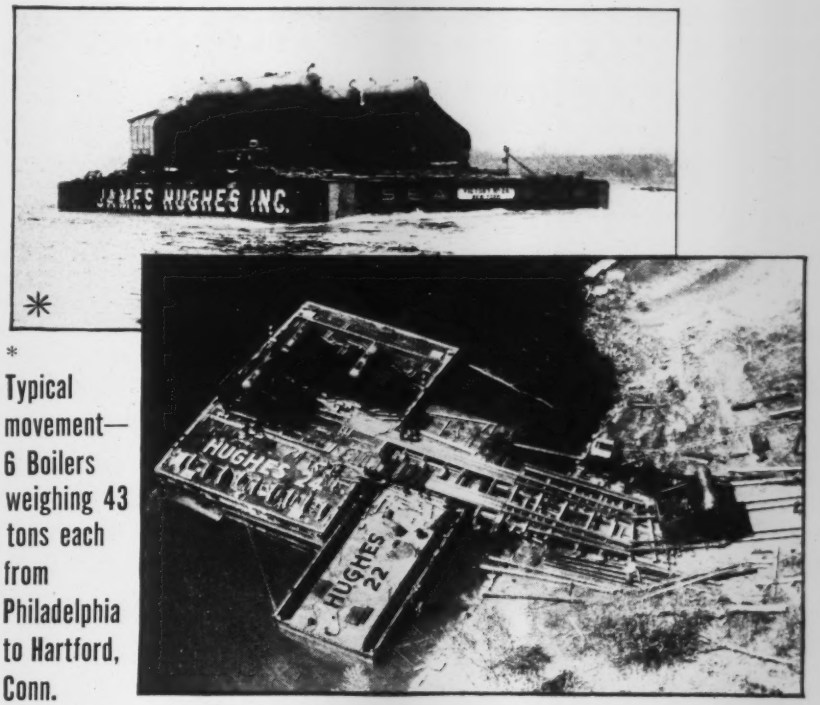


* Typical movement—6 Boilers weighing 43 tons each from Philadelphia to Hartford, Conn.

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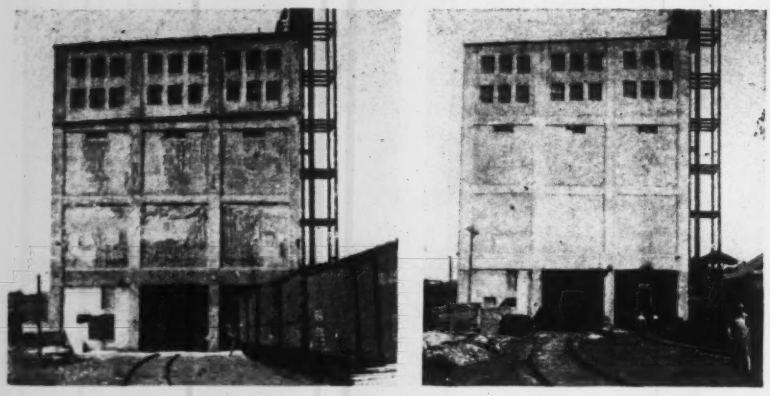

## "GUNITE" RESTORES CONCRETE BUILDING

The before and after photos show the breaker building at Cayuga Rock Salt Company, Myers, N. Y. This concrete building was badly disintegrated due to salt action on the reinforcing steel. Last year we contracted the complete reintegration of the walls and roof of this building.

The disintegrated areas of the walls were chipped and the entire surface washed and sandblasted. Reinforcing mesh was placed over the entire area and 1½" minimum "GUNITE" applied, and brush finished. The roof slab was similarly repaired with "GUNITE," both top and bottom. Sufficient old concrete was chipped away to prevent increasing the dead load of the roof slab.

"GUNITE" is impervious, thus it will not permit the infiltration of salt brine to attack the reinforcement. Its use as armor against sea water and conditions such as above described is very common, and its success remarkable.

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tired through the issuance of bonds at a later date.

## ASF to help road studies in northwest states

Invitations from joint fact-finding legislative committees of Oregon and Washington to provide engineering consultants on state-wide highway development studies have been accepted by the Automotive Safety Foundation. The work will be similar to that in California last year.

G. Donald Kennedy, vice-president in charge of the ASF highway division, will have charge of the studies and prepare a report of findings in each state. Active direction of the work in both states has been assigned to Carl Fritts, ASF highway engineer. D. Grant Mickle, traffic engineer; Joe Mattson, west coast representative, and other ASF staff specialists are expected to participate.

The foundation already is serving in an advisory capacity on a similar state-wide study now under way in Michigan. Governor Kim Sigler has vetoed a bill which would have raised Michigan's gasoline tax one cent, allocating the additional revenue to counties and cities. The governor said that the state-wide survey of highway needs should be completed before such action for new highway revenue is taken.

When the Washington and Oregon work is completed, ASF engineers will have conducted a fact-finding highway studies for the entire west coast region.

## AASHO group to study toll highway question

A special committee to study the various factors involved in the construction of toll highways has been created by the American Association of State Highway Officials.

W. W. Polk, chief highway engineer in Illinois, and AASHO vice-president for Region 3, will serve as chairman of the committee. He will be assisted by the chairmen of the eight major subcommittees of the association's committee on administration.

These men are: D. C. Greer, Texas state highway engineer; G. T. McCoy, California state highway engineer; H. S. Fairbank, deputy commissioner of the Public Roads Administration; J. M. Devers, chief council of the Oregon State Highway Department; F. C. Balfour, chief right-of-way agent in California; W. A. Codd, chief auditor of the Maryland Road Commission; Spencer Miller, Jr., New Jersey state highway commissioner; and F. M. Bark Illinois engineer of highway research